Ellenzweig Associates, Inc.
Architects

Joslin Diabetes Center

Research and Clinic Facility Expansion

Final Project Impact Report

September 1991

Joslin Diabetes Center

Dedicated to Diabetes Research, Treatment, Education, and Youth Programs

One Joslin Place
Boston, Massachusetts 02215

(617) 732-

September 25, 1991

Mr. Gerard Kavanaugh
Director of Institutional Planning
Boston Redevelopment Authority
One City Hall Square
Boston, MA 02201

Dear Mr. Kavanaugh:

The Joslin Diabetes Center is pleased to present the Final Project Impact Report as part of our voluntary cooperation with Article 31 of the Boston Zoning Code. This report includes the additional information, corrections and clarifications requested in the Boston Redevelopment Authority's Preliminary Adequacy Determination of June 24, 1991.

Joslin Diabetes Center is the preeminent institution in the country for the study and treatment of diabetes. The level of activity has outgrown the current facility. The pressure for space comes from expanding areas of inquiry in research and the increasing incidence of diabetes and its complications.

Joslin's main wing was built on Brookline Avenue in 1976, at a height of four stories. The structure was sized for additional floors, and the elevator shaft was constructed to accommodate a total of seven floors. The plan is to complete this building now, adding three stories on Brookline Avenue to allow research activities to grow. At the same time the goal is to raise the interior courtyard by one story, to the Pilgrim Road level, to create a new treatment area for eye patients.

We are committed to the program objectives that this project will make possible. The facility will meet our space needs for research and treatment into the next century. Thank you for your efforts in the public review process.

Sincerely,

Constance L. Stubbs

Constance L. Stubbs
Administrator

Enc.

Contents

General Information A

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February 27, 1991

Mr. Robert Tullis
Ellenzweig Associates, Inc.
1280 Massachusetts Avenue
Cambridge, Massachusetts 02138

Re: Joslin Diabetes Clinic -
Research & Clinical Facility Expansion

Dear Rob:

In response to the request for information contained in the B.R.A. Scoping Determination, the following should be included as the response to Article IV, Section A.1.b (Legal Information):

Legal Information. There are no legal judgments or other actions pending which involve the Project, other than the order issued in February by Judge David Mazzone in United States of America v. Metropolitan District Commission et al. (U.S. District Court, D. Mass. Civil Action No. 85-0489-MA) (imposing a moratorium on MWRA sewer connections in the entire MWRA district). The entire Project site is owned in fee simple and controlled by Joslin. There are no restrictive covenants or contractual restrictions affecting Joslin's right or ability to accomplish the Project. There are no public easements, into or through the site. The site is bounded on four sides by public streets.

Please send to me a copy of the completed response for my files when it is submitted to the B.R.A.

Sincerely,

Jim Whalen

James M. Whalen

JMW/wah

cc: Ms. Constance L. Stubbs

Financial Information and operating Pro-Forma are included in the following pages.

BOSTON REDEVELOPMENT AUTHORITY
APPENDIX 1
REQUIRED FINANCIAL INFORMATION

JOSLIN DIABETES CENTER
RESEARCH AND CLINIC FACILITY EXPANSION

Specific Responses to Appendix 1

Pro-Forma

Attached are the most recently completed operating pro-formas through fiscal year 1997.

Land Costs

The proposed project is a three story addition to existing buildings. No land costs are to be incurred for the project.

Acquisition Expense per Project Component

Not Applicable-no land costs

Hard Costs Per Unit

	Total	FAR	COST PER FAR
Construction	$21,600,000	74,420	$290.24
Furniture and Equipment	1,700,000	74,420	$22.84
Contingency	1,400,000	74,420	$18.81
Capitalized Interest	859,000	74,420	$11.54
Total Hard Costs	$25,559,000	74,420	$343.44

March, 1991

Soft Costs Per Unit

Architect Fees	2,407,300	74,420	$32.35
Consultant,Legal	325,000	74,420	$4.37
Moving	78,000	74,420	$1.05
Reimbursables	40,000	74,420	$0.54
Misc. Services	50,000	74,420	$0.67
Total Soft Costs	$2,900,300	74,420	$38.97

Contingencies per Unit

	Total	FAR	Cost per FAR
Construction Contingency (Included in construction costs)	2,808,000	74,420	$37.73
Additional Contingency	1,400,000	74,420	$18.81
Total Contingency	4,208,000	74,420	$56.54

Financing Terms-Assumptions

The attached pro-forma includes the following financing assumptions:

Management intends to finance the project through a capital fund-raising campaign, which is expected to generate approximately $30 million in pledges during the five-year period ending September 30, 1994. Interim funding requirements are expected to be met through cash generated by operations in excess of board designated investment requirements and through unrestricted gifts and bequests. Short term cash requirements in excess of funds available through these sources are forecasted to be met through a construction line-of-credit, to be repaid subsequent to project completion.

It is assumed that the construction line-of-credit will cary an assumed interest rate of 10%. Interest forecasted through the completion date of

the project has been capitalized. Total draws are assumed to be repaid in 1994 with capital campaign funds. Specific financing fees are as follows:

Underwriter Fees	$200,000
Trustee	6,000 - 8,000
Trustee Counsel	4,000 - 7,000
Feasibility Study	25,000-30,000
Bond Counsel	40,000-60,000
Credit Enhancement	10,000-15,000
Ratings	15,000
Authority Fee	30,000-50,000
Miscellaneous	10,000-15,000
	325,000-400,000

Total Development Costs (TDC) by Component

	Total	FAR	COST PER FAR
Construction	$21,600,000	74,420	$290.24
Furniture and Equipment	1,700,000	74,420	$22.84
Contingency	1,400,000	74,420	$18.81
Capitalized Interest	859,000	74,420	$11.54
Architect Fees	2,407,300	74,420	$32.35
Consultant, Legal	325,000	74,420	$4.37
Moving	78,000	74,420	$1.05
Reimbursables	40,000	74,420	$0.54
Misc. Services	50,000	74,420	$0.67
Total Development Costs	$28,459,300	74,420	$382.41

Sources of Debt and Equity

See above section entitled "Financing Terms-Assumptions".

Projected Financing Sources

Management is currently evaluating competitive proposals from HEFA and MIFA . In addition, competitive proposals from five underwriters are also being evaluated. Also, as indicated above, the Center is in the initial stages of its capital campaign.

Management expects to complete its evaluation of financing alternatives by approximately July,1991.

Gross and Net Square Feet

	EXISTING		ADDITION		TOTAL	
	GSF	FAR SF	GSF	FAR SF	GSF	FAR SF
Clinic, Research Labs, Administration	154,240	136,810	84,230	74,420	238,470	211,230
Retail	12,000	12,000	-	-	12,000	12,000
Total	166,240	148,810	84,230	74,420	250,470	223,230

Schedule of Rents

None of new square footage is expected to be rented.

Operating Costs per Square Foot

(Numbers in thousands)

	1990	1991	1992	1993	1994	1995	1996	1997
General Fund	12,232	13,712	14,708	15,927	18,278	19,098	20,641	22,264
Research	9,876	10,419	10,972	11,569	14,558	16,550	18,612	19,686
External Relations	1,407	1,422	1,438	1,455	1,473	1,492	1,512	1,533
Total	23,515	25,553	27,118	28,951	34,309	37,140	40,765	43,483
FAR SQ FT	148,810	148,810	148,810	148,810	223,230	223,230	223,230	223,230
COST PER SQUARE FOOT	$158.02	$171.72	$182.23	$194.55	$153.69	$166.38	$182.61	$194.79

Tenant Inducements

Not Applicable

Expense Assumptions

See attached note #8. Operating Expenses .

Anticipated Leasing Patterns

Not Applicable

Calculation of Debt Service

Below are the Construction loan interest and principal payments. It is assumed that the Construction Loan will be fully paid off by the end of FY 1994 through the proceeds of the capital campaign.

Construction Loan (Dollars in Thousands)

	1990	1991	1992	1993	1994
INTEREST EXPENSE	35	83	210	531	369
PRINCIPAL PAYMENTS					7365

Anticipated future refinancing

Interest rates are currently at their lowest level for the past several years. Therefore, management does not anticipate future refinancing.

Projections of Research Income

	1990	1991	1992	1993	1994	1995	1996	1997
Government Sponsored	5,330	5,773	6,103	6,460	7,816	8,774	9,951	10,930
Private Agency	789	855	903	956	1,157	1,299	1,473	1,618
Other Research	1,003	1,086	1,149	1,216	1,471	1,651	1,873	2,057
Center Funded	387	419	443	469	568	637	722	794
Fellowship and Training	605	655	693	733	887	996	1,129	1,241
Specific Purpose & Clinic Studies	227	246	260	275	333	374	424	466
Total	8,341	9,034	9,551	10,109	12,232	13,730	15,572	17,104

JOSLIN DIABETES CENTER, INC.
FORECASTED STATEMENTS OF REVENUES AND EXPENSES
(In Thousands of Dollars)

	For Fiscal Years Ending September 30,							
	1990	1991	1992	1993	1994	1995	1996	1997
OPERATING REVENUES (Note 3 and 4):								
Charges for patient services	$ 14,881	$ 16,953	$ 18,571	$ 20,576	$ 22,695	$ 24,928	$ 27,434	$ 30,197
Deductions from charges:								
Contractual allowances	4,326	5,050	5,668	6,425	7,235	8,099	9,074	10,158
Provision for uncollectible accounts and free care	777	1,017	1,114	1,235	1,362	1,496	1,646	1,812
Total deductions from charges	5,103	6,067	6,782	7,660	8,597	9,595	10,720	11,970
Net charges for patient services	9,778	10,886	11,789	12,916	14,098	15,333	16,714	18,227
Other operating revenues (Note 5)	3,247	3,566	3,933	4,285	5,525	5,210	4,862	5,086
Total operating revenues	13,025	14,452	15,722	17,201	19,623	20,543	21,576	23,313
OPERATING EXPENSES (Note 8):								
Salaries, wages and benefits	9,570	10,795	11,690	12,800	14,273	15,715	17,322	18,900
Supplies and other expenses	4,786	5,194	5,504	5,818	7,255	7,644	8,058	8,495
Depreciation and amortization	888	950	967	998	1,881	1,890	1,940	1,852
Interest	274	240	199	162	490	84	47	10
Overhead allocation:								
To research	(3,016)	(3,182)	(3,351)	(3,533)	(5,285)	(5,880)	(6,351)	(6,597)
To development and communications	(270)	(285)	(301)	(318)	(336)	(355)	(375)	(396)
Total operating expenses	12,232	13,712	14,708	15,927	18,278	19,098	20,641	22,264
EXCESS OF OPERATING REVENUES OVER EXPENSES BEFORE RESEARCH OPERATIONS	793	740	1,014	1,274	1,345	1,445	935	1,049
RESEARCH OPERATIONS (Note 6):								
Transfers from research and other specific purpose funds	8,341	9,034	9,551	10,109	12,232	13,730	15,572	17,104
Direct and allocated expenses	(9,876)	(10,419)	(10,972)	(11,569)	(14,558)	(16,550)	(18,612)	(19,686)
INSTITUTIONAL SUPPORT OF RESEARCH OPERATIONS	(1,535)	(1,385)	(1,421)	(1,460)	(2,326)	(2,820)	(3,040)	(2,582)
DEFICIT OF OPERATING REVENUES OVER EXPENSES	(742)	(645)	(407)	(186)	(981)	(1,375)	(2,105)	(1,533)
NONOPERATING REVENUES AND EXPENSES (Note 7):								
Unrestricted gifts and bequests (Note 10)	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Investment income	640	932	1,048	1,164	1,356	1,589	1,801	2,041
External relations	(1,407)	(1,422)	(1,438)	(1,455)	(1,473)	(1,492)	(1,512)	(1,533)
Net nonoperating revenues	2,233	2,510	2,610	2,709	2,883	3,097	3,289	3,508
EXCESS OF REVENUES OVER EXPENSES	$ 1,491	$ 1,865	$ 2,203	$ 2,523	$ 1,902	$ 1,722	$ 1,184	$ 1,975

8. Operating Expenses:

Operating expenses consist of several major expense categories, including salaries and wages, fringe benefits, utilities, supplies and other expenses, depreciation and interest expense. Each of these components was analyzed separately and forecasted for 1990 through 1997 as described in the following sections.

Salaries and Wages

Salary and wage expense was forecasted based upon an analysis of staffing patterns and changes in salary and wage rates. Staffing levels for 1990 through 1997 have been forecasted by management based upon expected volume changes and the impact of the growth in research on overhead and support departments of the Center.

Management has forecasted staffing in full-time equivalents ("FTE's") from 1990 through 1997 as detailed below. This forecast includes the addition of a total of seven new physicians from 1993 to 1997.

	Center*	Satellite
Historical		
1987	171	-
1988	186	-
1989	191	-
Forecast		
1990 (budgeted)	203	7
1991	207	10
1992	211	10
1993	216	10
1994	226	10
1995	234	10
1996	240	10
1997	245	10

* Excludes direct research staff

Forecasted salaries and wages for 1990 through 1997 are based on the above staffing levels and annual increases that are estimated as follows:

	Average Annual Increase
Historical	
1987	4.0%
1988	6.0
1989	6.0
Forecast	
1990 (budget)	6.5%
1991-1997	6.2

Historical rates of increase reflect both merit increases as well as market rate adjustments for specific job classifications.

Fringe Benefits

Forecasted fringe benefits include Social Security, health insurance, retirement benefits and workers' compensation. These expenses have been estimated by management based upon the historical ratio of fringe benefits to salaries and wages.

The following table shows the relationship between salaries and wages and fringe benefits historically and over the forecast period:

	Fringe Benefits as a Percent of Salaries
Historical	
1987	17.2
1988	17.1
1989	20.4
Forecast	
1990 (budget)	20.8
1991-1997	21.1

Supplies and Other Expenses

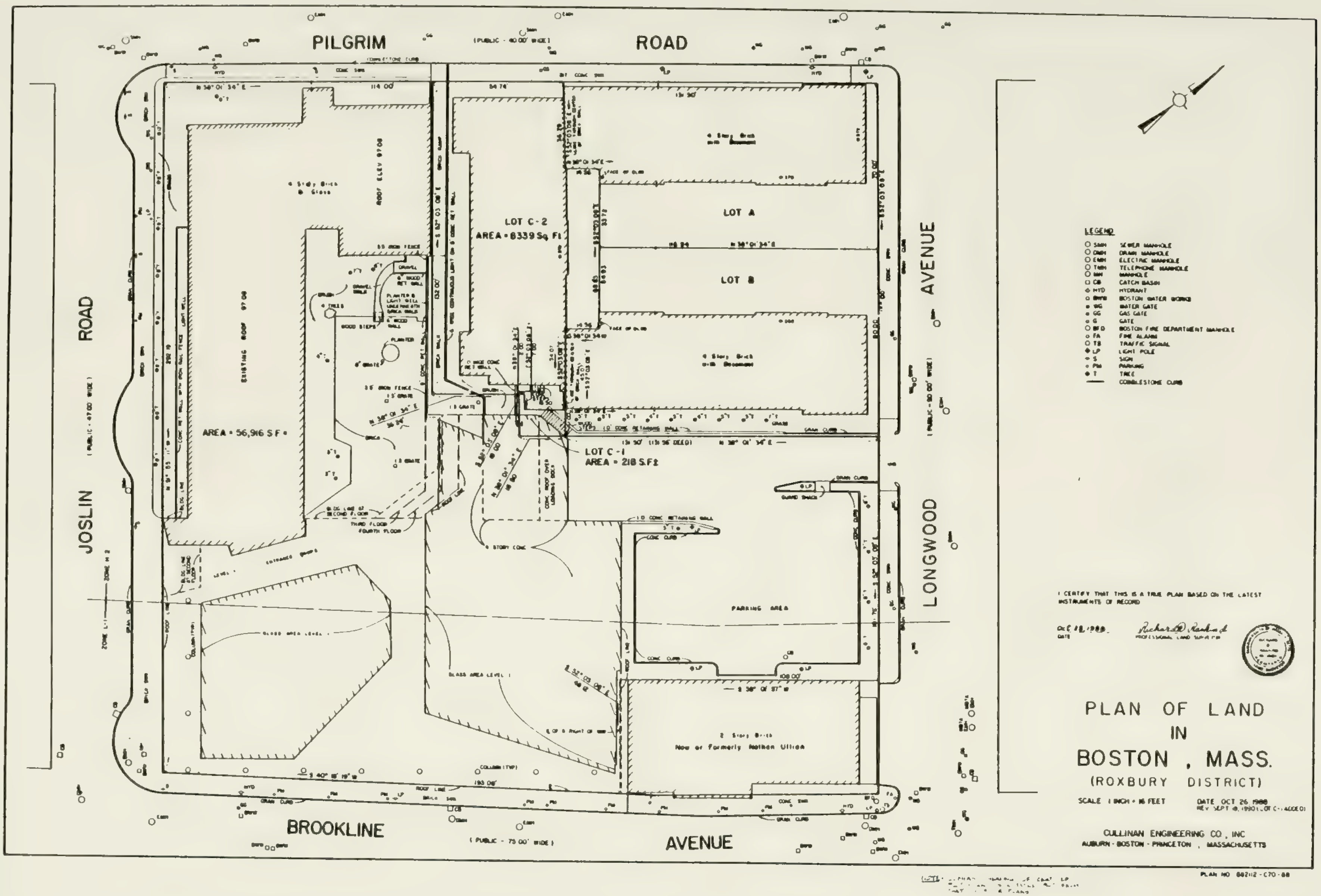
Supplies and other expenses (excluding direct research costs, which are described in Note 6) have been forecasted based on the estimated volume of services to be provided over the period of the forecast adjusted by an assumed inflation index of 4.1% and the estimated impact of the project related space.

Specific expense categories affected by growth in volume and the addition of new space include:

- Variable supply costs, which are expected to increase approximately 3.6% annually due to the growth in volume.

- Utility expense, which is forecasted on the basis of a 5.3% annual inflation estimate, and a 44.4% increase in total square footage in 1994, upon completion of the project.

See certified plot plan on following page.



Joslin Diabetes Center:
Research and Clinic
Facility Expansion

Notes:

CERTIFIED
PLOT PLAN

L-1.1

a. Tax Revenues

Joslin pays Boston real estate taxes for street level retail space it owns on Brookline Avenue and for space it rents at the corner of Longwood and Brookline Avenues. Taxes for fiscal 1991 are as follows:

415 Brookline Avenue	$ 47,545.55
Ullian Building, 352 Longwood	15,721.90
Total	$ 63,267.45

b. Anticipated Employment Levels

The proposed project is expected to create the following employment:

1) 125 construction worker years

2) 58 new permanent jobs

c. Other Public Benefits

Please see the community benefits statement summarized on the following pages.

Joslin Diabetes Center

Dedicated to Diabetes Research, Treatment, Education, and Youth Programs

One Joslin Place
Boston, Massachusetts 02215

(617) 732-

JOSLIN DIABETES CENTER

FACILITY EXPANSION PROJECT

COMMUNITY BENEFITS

This document is section A4C of the Draft Project Impact Report prepared by Joslin Diabetes Center for the Boston Redevelopment Authority pursuant to Article 31 of the Boston Zoning Code. The proposed project is approximately 72,350 FAR square feet of new construction consisting of a three floor addition to Joslin's Root Wing on Brookline Avenue and elevation of the existing courtyard to provide street level clinical space accessible to eye patients.

1. <u>HEALTH CARE</u>

- Joslin is a unique resource for people with complicated diabetes. Because Joslin researchers and physicians focus on diabetes and because so many people with the disease visit (170,000 in 90 years), Joslin has a concentration of knowledge and support to help people manage this difficult disease.

- Boston residents made almost 14,000 visits to Joslin in fiscal 1990. Over the last five years more than 4,000 different Bostonians have been treated. This group represents more than one out of every four persons in Boston who might be expected to have diabetes which has been diagnosed.

- Donors make Joslin's quality of work possible. Both lines of work - research and patient care - create financial deficits for Joslin. Charitable contributions support operations not covered by grants or fees.

- Boston residents without financial means come to Joslin. The chart below illustrates the percentage of persons having either Medicaid or no insurance.

Sample Services	All Patients	Boston Residents
Pediatrics	31%	35%
Pregnancy	28%	50%
Mental Health	26%	51%

- Joslin is a clinic, not a hospital, and does not get reimbursed for uncompensated care. Joslin has provided $4.8 million in unreimbursed services over the last 5 years.

4/16/91

- Joslin hosts a free health fair each year at the Center. The day features lectures on advances in research; demonstrations of new products like home blood glucose monitoring kits; and screening for eye disease, kidney function, and cholesterol. About 500 people attend.

- Lectures on understanding diabetes are patient-centered and open to the public twice a week. Joslin will mail notice of these free lectures to community groups in Mission Hill.

- Joslin participates in the LMA/Mission Hill/Fenway Food Project. The project provided emergency assistance food to 5,000 individuals last year.

- Discussions are under way with Roxbury Comprehensive Community Health Center to explore areas for cooperation. The initial focus is expected to be on professional education for both groups. Joslin offers courses and seminars in diabetes management for physicians, nurses, and dieticians.

2. <u>YOUTH PROGRAMS: CAMP FOR CHILDREN WITH DIABETES</u>

- Joslin operates a camp for boys with diabetes in Charleton, Massachusetts and provides medical supervision for the girls' camp. Almost three hundred children attend Camp Joslin each summer. More than half receive financial aid. Joslin subsidized the camp by $300,000 last year, because affordable camper fees cannot cover the level of staffing and medical care needed.

3. <u>JOB TRAINING AND EMPLOYMENT</u>

- Approximately 100 Boston residents work at Joslin. Another 250 persons from greater Boston are employed. Joslin infuses $17.6 million in salaries into the metropolitan area.

- In 1990 Joslin attracted $25 million to the region: $11 million in research support, and $14 million for clinical and other activities. Seven out of every ten major donors live outside Massachusetts and contribute to the local economy.

- Joslin is conducting a $45 million capital campaign to support the cost of new facilities and programs. Of this amount, 90% will come from outside Boston to be spent in this area for staff and services.

- The proposed addition to the Joslin Building on Brookline Avenue is expected to create 60 new jobs.

- Joslin will target job opportunities to individuals in the Mission Hill community who may be in need of employment and training. Priority groups identified include:

  - current Joslin employees in entry level positions with potential for employment upgrading who are Mission Hill residents; and

  - Residents of Mission Hill. Joslin will circulate notices of open positions to community agencies.

- Joslin will work with the Private Industry Council to recruit Mission Hill youths for summer jobs, school year positions, and career training programs.

- Joslin works actively with the Private Industry Council (PIC) and others to identify job applicants. As part of its commitment to employing to Boston residents, Joslin recently hired fifteen people through organizations working to promote local employment. Those agencies include ABCD, Boston English High, Laboure College, PIC, Roxbury Community College, Training Inc. and others.

- This winter Joslin hosted a meeting of approximately 20 recruiters from health care organizations and invited five Private Industry Council representatives from Boston high schools to talk about hiring Boston students.

- Job training is ongoing. At Roxbury Community College's job fair, Joslin staff conducted an interviewing skills workshop for interested students. Medical terminology classes are among those offered on site to Joslin staff who need increased skills to advance. On-site English as a Second Language classes are under development.

- Joslin's tuition reimbursement program pays half the cost of job related course work for full time staff.

4. <u>CONSTRUCTION EMPLOYMENT</u>

- The expansion of facilities is expected to create new jobs for 225 people over the 2 1/2 years of construction, 40 to 70 at a time. This represents 125 worker years. The construction budget is estimated at $18 to $21 million with a start date in the second half of 1991.

- The General Conditions will specify that the Contractor shall designate a representative to visit the Business agent of each trade union involved to encourage the promotion of work opportunities to members from adjacent neighborhoods, particularly Mission Hill. The Contractor's representative will help promote neighborhood awareness of trade union jobs through mailings to specific Mission Hill community agencies.

- Joslin agrees to make best efforts to abide by the Boston Residents Jobs Policy (50% - 25% - 10%) agreement targeting construction jobs to Boston residents, minorities, and women, and will work to provide construction employment opportunities for qualified Mission Hill residents across all categories.

5. <u>CHILDCARE</u>

- Joslin is a member of MASCO and and its day care center which is in the process of expanding. Ten slots have been pledged to Mission Hill and Fenway children. In the event that Joslin develops its own day care facilities in the future, it will work with community residents on making spaces available.

6. <u>NEIGHBORHOOD BUSINESS PARTICIPATION</u>

- The 12,000 square feet of street level retail space on Brookline Avenue will remain in the new project. In the event of a turnover in tenants, Joslin or its designated agent will make good faith efforts to use community agencies or publications to notify neighborhood businesses of space available for lease.

7. <u>TRAFFIC AND PARKING</u>

- <u>New Parking Demand.</u> The Proposed Project will generate a need for 26 employee parking spaces. This new demand will be accommodated in the 34 spaces leased by Joslin in the MASCO Garage.

- <u>Transit Subsidy.</u> Joslin offers MBTA passes to its employees through payroll deduction at a 25-percent discount up to a maximum of $15.00. This practice will continue.

- <u>Differential Parking Rates.</u> To encourage the use of public transportation and off-site parking facilities, Joslin will continue its practice of charging substantially higher rates for on-site parking spaces. As of April 1, 1991, employees pay a monthly fee of $66 to park off-site and $90 to park on-site.

- <u>Demand Reduction.</u> To help reduce the number of cars in the LMA, Joslin is introducing a daily voucher program to allow staff with parking privileges to use alternate transportation without losing the right to park on site.

- <u>Alternate Transportation.</u> Joslin participates in the Transportation Management Organization operated by MASCO. The emphasis is on actively promoting alternate means of transportation, primarily public transit and ridesharing.

- <u>Staggered Work Schedules</u> - To reduce peak hour transportation and parking impacts, Joslin will continue to encourage existing staff practices of staggered work schedules.

- Satellite. Joslin has opened a satellite on Route 9 in Framingham to make care accessible to patients without traveling to Boston.

8. CONSTRUCTION IMPACTS

- Construction Worker Parking. Construction worker parking will be accommodated off-site at the MASCO Lansdowne Street Garage at prevailing rates. Workers will be shuttled to the project site by the MASCO Shuttle. Contractors will be required by their contracts to enforce this provision among their employees.

- Public Transit. Each construction worker who agrees to commute to the job site via public transportation will be offered MBTA pass for that month at a discount.

- Ridesharing. Construction workers will be encouraged to participate in MASCO's ridesharing information program which is open to them.

- Truck Routes. Trucks from the north, northeast, and southeast are proposed to exit I-93 at Massachusetts Avenue traveling to the site via Ruggles Street and Huntington Avenue and departing via the same route. A Joslin representative will work with the Boston Transportation Department, BRA, and Community to define truck routes to avoid the intersections of Huntington and Longwood and limit impacts as part of the construction management agreement. Trucks to and from the southwest, west, and northwest will be directed to exit I-95/128 at Route 9, arriving at the site via Brookline Avenue to Longwood Avenue and departing via the same route.

The following sections are included herein:

A. Zoning analysis and requests for zoning relief.

B. Anticipated Permits and Approvals Schedule.

C. Massachusetts Environmental Policy Act review of the Project Environmental Notification Form and Project Team responses.

This analysis is offered as a guide to the zoning issues relative to the proposed facility expansion. Final determination of variances required must be made by the Zoning Department of Inspectional Services.

The analysis is based on the Boston Zoning Code amended through Text Amendment No. 144 effected date 17 September 1990 and Map Amendment No. 250 effective date 17 September 1990 and analyzes the variances required to build the scheme shown in the schematic design documents dated 13 July 1990. A preliminary information meeting has been held with Russell Forsberg, Zoning Administrator to discuss some project issues prior to preparing this analysis. This analysis has been prepared by Ellenzweig Associates Inc. and Palmer & Dodge.

Article 3 - Establishment of Zoning Districts

- Map 6: The site falls within two zoning districts: Residential District H-2 (Apartments) and Business District L-1 (Local business).
- Maps: There are no I.P.O.D.s which affect the site.
- 3-1A: The site does fall within two special purpose overlay districts - a restricted parking district and the Institutional district.

Article 6 - Conditional Uses

- 6-1: The Zoning Board of Appeals must grant a conditional use permit for conditional uses.
- 6-3A: The Zoning Board of Appeals must grant a conditional use permit for parking. Parking proposed must be ancillary to uses other than Use Items 1-15 and other conditions must be met.

Article 6A - Exceptions in Planning Development Areas

- 6-A1: This project is not a P.D.A.

Article 8 - Regulation of Uses

- 8-7: Joslin Diabetes Center activities fall under 6 categories of uses - as follows:

Use Item	Use	H2 Zone	L1 Zone
Use Item No. 22	Hospital, clinical, or professional offices accessory to a hospital	Condit.	Condit.
Use Item No. 24	Scientific research laboratory	Condit.	Condit.
Use Item No. 39A	Clinic not accessory to a main use	Condit.	Allowed
Use Item No. 77	Keeping of laboratory animals as an accessory use	Condit.	Condit.
Use Item No.79	Incidental uses accessory to a hospital	Allowed	Allowed
Use Item No.85	Any accessory use ancilliary to a lawful main use	Allowed	Allowed

Article 9 - Nonconforming Uses

- 9-1: The existing uses at Joslin are either allowed as of right or conditional, therefore Article 9 is inapplicable.

Article 10 - Accessory Uses

- 10-1: Area to be occupied by accessory uses other than off-street parking are limited to 25% of the floor area of the main buildings. The accessory use ; the keeping of laboratory animals (Use Item No. 77) will occupy approximately 4,100 SF of a total 223, 230 SF building (or 2%) upon completion of this project. Incidental accessory uses such as the cafe and gymnasium will occupy 3,400 SF (or 1.5%). Therefore a variance is not required.

- 10-2: This section limiting accessory uses in residential zone does not apply (no variance required) because the accessory uses are not accessory to a main dwelling

Article 11 - Signs

- 11-1,F: Signs are not permitted in residential districts except that a sign accessory to a non-conforming use is allowed in accordance with 11-2 if the area is one half the area allowed in non-residential districts.

- 11-2: Signs in non-residential districts are limited to sizes smaller than twice that proposed or located differently than proposed. Signs which do not conform may be permitted if the specific design is approved by the Urban Design Department of the BRA.

- Signage proposed will be reviewed during the design review process. Although a variance will not be required for signage which is eventually BRA approved, the signage will not be approved at the time of filing and therefore a variance should be sought.

Article 12 - Transition Zoning

- 12-1: The Joslin lot was not combined in single ownership as of 12/31/64 and therefore the ability to extend 30 feet onto the most restrictive district does not apply.

- 12-2: This section does not apply since H zones are not specifically included.

- 12-3: This section applies to Joslin Place and requires that the front yard setback of the L-1 district's frontage within 100' of the zone boundary (therefore the entire frontage) shall be equal to the front yard setback required in the H district (20 feet). A variance will be required for this article.

Article 13 - Dimensional Requirements

- Table B: The dimensional requirements for each district are as per the attached table.

Article 14 - Lot Size, Area, and Width

- Existing lot, as per plan by Cullinan Engineering, dated October 26, 1988 is 56,916 SF$\pm$.

- 14-1: Lot area is sufficient, as no minimum lot area is required in either the L-1 or H-2 districts.

- 14-3&4: Lot width is sufficient, as no minimum lot width is required in either the L-1 or H-2 district.

- 14-5: For the purposes of zoning the Joslin Wing, the Root Wing, and the addition are considered to be one building; therefore, "building to the rear of" does not apply.

Article 15 - Building Bulk

- The existing building (Joslin and Root Wings) is 148,810 SF (Institutional Master Plan) yielding an existing F.A.R. of 2.614. The schematic design proposes to add 74,420 gross SF of area, by zoning definition, to the top of the Root Wing. This addition will produce a total building size of 223,230 SF and a F.A.R. of 3.922. Both the existing and the new F.A.R.s exceed the F.A.R. limits of 1.0 in the L-1 zone and 2.0 in the H-2 zone. Thus a variance will be required.

Article 16 - Height of Buildings

- The proposed three floor addition plus mechanical headhouse on top of the existing Root Wing will produce an eight story height which will violate the limit of 3 stories and 35 feet mandated for the L-1 district. Therefore a variance will be required for that portion of the building addition which is in the L-1 district.

- Note that the definition of building height excludes "penthouse normally built above the roof not devoted to human occupancy and the total area of which does not exceed 33 1/3 percent of the roof." The proposed mechanical penthouse is 8,188 SF. The roof of the Root Wing addition is 20,440 SF. Thus, the mechanical penthouse occupies 40% of the roof on which it sits (I.S.D. interpretation) and will be considered a story for purposes of height calculation.

Article 17 - Open Space Requirement for Residences

- 17-2: Hospitals are specifically exempted from this requirements.

Article 18 - Front Yards

- Establishment of yards and yard depths for the Joslin lot is complex and, because of certain ambiguities in the Code, not free from conflicting interpretations. For ease of reference, the discussion of yards will refer to the attached sketch of the lot and which identifies the various sides of the lot.

- Designation of Yard

  Under the definition of "Lot line, front," the owner of a lot abutting on two or more streets may designate as the front lot line whichever of the two widest streets he chooses. Joslin has designated Side 1 - fronting on Joslin Place - as the front lot line. Side 1 is therefore the front yard.

  Section 18-4 states that if a lot abuts upon more than one street, the provisions of Article 18 apply along every street line, except as otherwise provided in Section 19-6. Four sides of the lot abut streets. Section 19-6 provides that the front yard and front setback apply to that part of a side lot line which is also a street line extending more than 100 feet from the intersection of such line with another street. This provision applies to Side 2 - along Pilgrim Road where the distance along the side line from the intersection is 114 feet - and to Side 10 - along Brookline Avenue where the distance along the side line from the intersection is 193.08 feet. Section 19-6 contains, in paragraph (b), a second exception imposing a different yard depth requirement for certain H Districts only. Side 2 is in the H District and also abuts a street line; therefore, Side 2 appears to be a side yard and the provisions of Section 19-6(b) govern the depth of that yard.

- Required Front Yard Depths

  Side 1 is located, in part, in the L-1 District and, in part, in the H-2 District. In the L-1 District a front yard of 10 feet is required (Table B). In the H-2 District a front yard of 20 feet is required. Section 12-3, previously discussed, extends the H District's 20 foot requirement to the L1 District's frontage within 100 feet of the district boundary line, or all of it. A variance from the front yard depth requirement along Joslin Place will be required.

  Side 2 is discussed later as a side yard.

  Side 7 is for purposes of yard depth requirements treated the same as Side 1, above. Side 7 will not require a variance.

  Side 10 is located entirely in the L-1 District and generally would require a yard depth of 10 feet. Section 18-2, however, permits a modal front yard depth where, as is the case along Brookline Avenue, two or more buildings front on the same side of the street. The Ullian Building and the Root Wing front on Brookline Avenue and each has a zero yard depth. Therefore under 18-2 a zero yard depth is permitted along Side 10.

- Section 18-3 states that traffic visibility across the corner of Joslin place and Brookline Avenue must be maintained by a clear 30 x 30 triangle. The existing building violates this triangular area and even though the addition of the fifth, sixth and seventh stories is obviously too high above the street to affect traffic visibility, it is considered by the zoning department to extend a pre-existing violation and therefore will require a variance.

Article 19 - Side Yards

- Designation of Yards

  Each of the yards parallel to Brookline Avenue and Pilgrim Road, with the possible exception of Side 10, are side yards subject to the side yard depth requirements of the Code.

- Required Side Yard Depths

  In the H-2 District no side yard is required between the front yard required by the Code and a line parallel thereto and seventy feet in the rear thereof. This provision applies to Side 2. The existing conditions at Pilgrim Road violate this slightly and a variance may be required to cover unaltered existing conditions. This provision may also apply to Side 6. As a matter of administration interpretation the Inspectional Services Department may consider Side 7 as a rear yard (as to which certain front yard requirements apply) in which case this seventy foot provision would not apply to Side 6; or it may simply consider Side 7 as a front yard in which case the seventy foot provision would apply to Side 6.

  In the H-2 District no side yard is required along any side lot line on which a building on the adjoining lot abuts between the required rear yard and the seventy foot line (referred to above. This provision appears not to apply.

  Generally in the H-2 District side yards must be equal in depth to ten feet plus one-twentieth of the length of the wall parallel to the side lot line. Therefore the side yard depths for Side 4 and Side 6 (in part) are governed by this formula. A variance will be required for that portion of Side 4 which is encroached on by the elevator tower. It should be noted, however, that since this addition merely "fills in" the elevator lobbies, the pre-existing situation is not really being "increased."

  In the L-1 District no side yard is required, except in situations where the side lot line abuts an H, S, or R District. Although Side 8 is close to the H Zoning District line, it does not abut the line. Side 8 requires no yard.

Article 20 - Rear Yards

- Designation of Yards

  Each of the lot lines to the rear of, and parallel to, Joslin Place, with the possible exception of Side 7 and Side 9, are rear yards and subject to the rear yard depth requirements of the Code.

- Required Yard Depths

  Generally in an H-2 District the rear yard depth must equal ten feet plus one-twentieth of the length of the wall parallel to the side lot line.

  Under Section 20-4, however, in an H-2 District, a lot with side yards conforming to Section 19-4 need not have a rear yard deeper than twenty feet; otherwise, a maximum thirty feet is required. Side 3 and Side 5 are governed by these provisions.

  Under Section 20-7, Side 7 is subject to the front yard requirements of the Code. Side 5 is subject to the rear yard requirement of 10' + L/20 and may require a variance for the existing stair and elevator tower.

Generally in the L-1 District rear yards must be twenty feet, except as otherwise provided in Section 20-5 (which does not pertain). Side 9 falls within the L-1 District and may be interpreted as a side line (because it is adjacent to other side and perpendicular to Brookline which is a modal front yard) or as a rear line (because it is parallel to the rear of Joslin Place which is a front yard). If it is interpreted as a side yard no setback is required; if it is interpreted as a rear yard, a 20 foot depth is required and a variance will be necessary.

Article 21 - Set Backs

- For the purposes of applying the set back of parapet formula required by Table B in the H-2 Zone (H+L'/6), the Joslin Place lot line (Side 1) is considered to be a front street line. Taken as a whole (regardless of bumps, notches, and other features which may be altered during Design Development), the wall facing this street line is 107 feet long. The top of this wall (exclusive of the penthouse) is at elevation 125'-6"±. Grade is defined as "the average elevation of the nearest sidewalks at the line of the street or streets which the building abuts." Depending on the zoning administrator's interpretation, this could be either the average grade of the sidewalks directly abutting the Root Wing (elev. 39'-3") or the average grade of the sidewalks abutting the Root and Joslin Wings including the sidewalk at Pilgrim Road (elev. 42'-10"). Section 21-2 states that no set back is required below either the combined height of the first and second story above-grade or 25'-0", which ever is lower. The combined height of the first and second story above elevations 39'-3" is 22'-10" and the height above elevation 42'-10" is 19'-3". Both are less than 25'-0" and thus are used to produce an "H" of 63'-5" (height from 3rd floor elevation 62'-1" to roof elevation 125'-6"). Section 21-1 states that when walls face streets or public open spaces, the formula result may be reduced by half the width of the open space or 50 feet, whichever is less. Joslin Place, the park, and Deaconess Road are, taken together, in excess of 100 feet and therefore the 50 foot dimension will apply. The formula for setback of parapet for the Joslin Place wall is therefore:

  [(63'-5" + 107')/6] = 28' - 50' = 0

  No setbacks are required along this wall.

- The lot line facing Brookline Street (Side 10) is considered a side lot line for the purposes of applying the setback of parapet formula, but because this lot line is wholly within the L-1 District, no setback of parapet is required for the wall facing Brookline Street.

- The lot line facing the Ullian Building (Side 9) may be considered a side lot line for the purposes of setback of parapet. If so, then the portion of the wall within the H-2 district will be subject to the setback formula. No actual setback in the wall will be required, however, because the lot line at Longwood Ave. is 108 feet from this wall and the formula provides a result (without subtracting half of Longwood Avenue's width) as follows:

  Elev. 125'-6" - Elev. 39'-3" = 86'-3" Building Height - 60'-0" = 26'-3"

  [26'-3" (H) + 106 (L')]/6 = 22'

  If this line is considered a rear lot line for the purposes of setback of parapet, then the 60' side yard exception would not apply and the formula would be

  [86'-3" (H) + 106 (L')]/6 = 32'

  No actual setback is required, again, because the lot line is 108' from the wall.

- Similarly, the wall facing the courtyard is set back far enough from Pilgrim Road (185' back) to not require any actual setbacks as follows:

  [63'-5" (H) + 125'-0" (L')]/6 = 22'

- The mechanical penthouse currently has a step back profile. The main section is 16'-0" above the roof producing an "H" of 79'-5" (63'-5" + 16'-0"). It is shown as 90 feet wide facing Joslin Place and set back 10'-8" from the lot line. The "attic" section is 6'-0" higher than the main section, producing an "H" of 85'-5". It is 55 feet wide and is set back an additional 6'-0". The formulas for this penthouse as it faces Joslin Place are:

Main Section:	[79'-5" + 90]/6 = 28	Attic:	[85'-5" + 55]/6 = 23
	28 - 50 = 0		23 - 50 = 0

- The only variance needed for setback of parapet will be for the elevator and lobby tower setbacks from the small side and rear lot lines at the back corner of the site. As noted previously these are pre-existing situations, but will probably require variances due to the infill construction of the lobbies.

<u>Article 23 - Parking</u>

- Because the project is in a Restricted Parking District, parking is considered a conditional use. No variance is required to omit a conditional use otherwise required by the Code.

<u>Article 24 - Off Street Loading</u>

- 24-1: Use items 22 and 24 are Group II uses and require 3 loading bays for a building area between 150,000 and 300,000 s.f. The Joslin facility is proposed to be 223,230 with all proposed additions.

- Retail uses are less than 15,000 s.f. and therefore require no bays.

- 24-2: Bays shall be 10 feet wide, 25 feet long, and 14 feet high. Bays within 50 feet of a residential zone shall be enclosed if the use regularly involves night use. Joslin does not use their loading bays at night and thus enclosure is not required.

- The existing loading dock area provides for 3 Bays of the minimum size and is not enclosed; it therefore meets the requirements for the new addition.

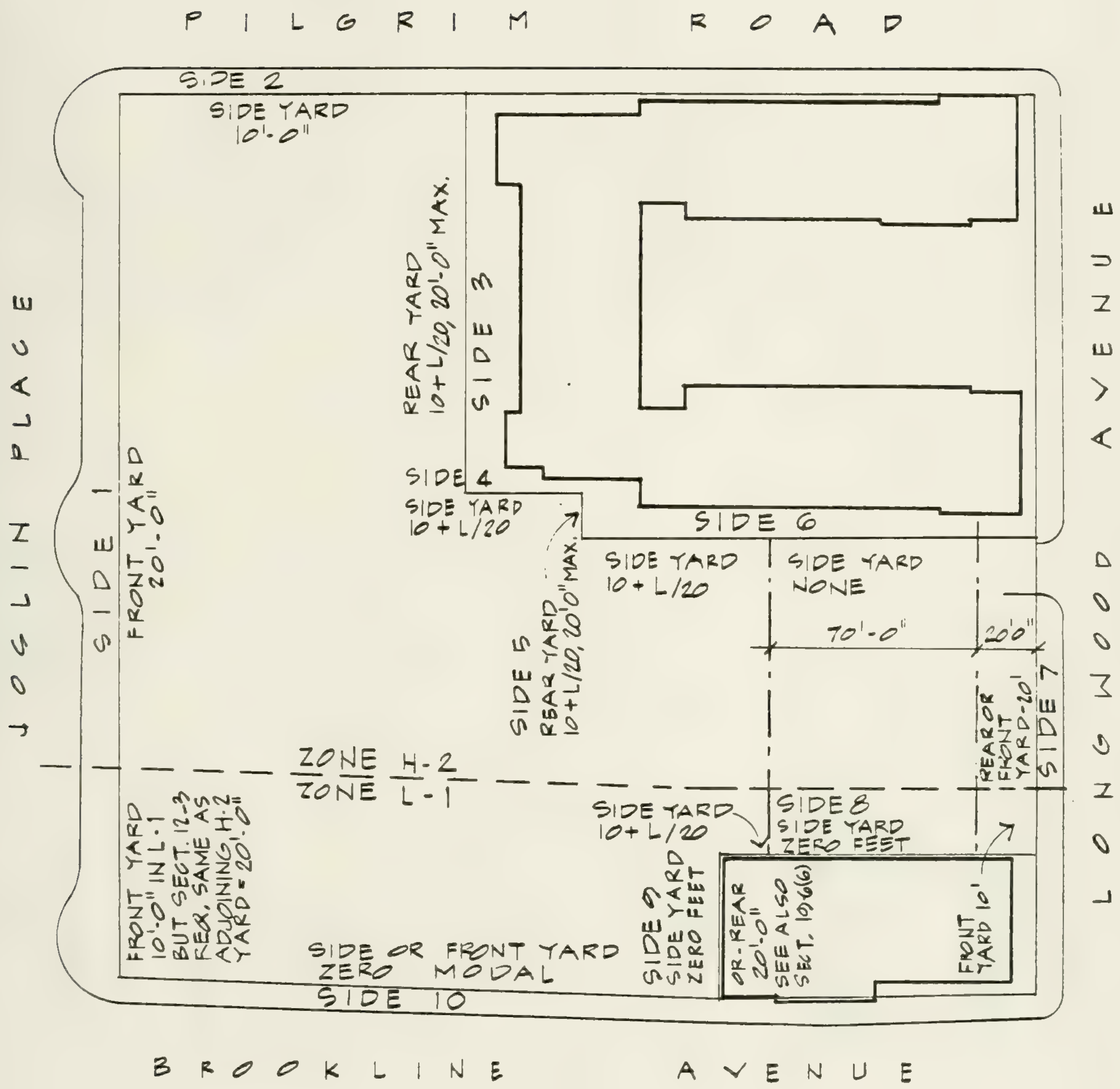
<u>Article 26 - Development Impact Project</u>

- The proposed expansion of the Joslin Diabetes Center does not qualify as a D.I.P. because its total area increase is less than 100,000 s.f.

<u>Summary</u>

In conclusion, the following zoning variances are identified as necessary to build the project as proposed:

1. Conditional Uses (Article 6).
2. Extension of existing non-conforming uses (Article 9).
3. Signage (Article 11).
4. Insufficient front yard in Transitional Zoning Lot (Article 12).
5. Excessive floor area ratio (Article 15).
6. Excessive building height in L-1 District (Article 16).
7. Insufficient front yard (Article 18).
8. Encroaching on traffic visibility across corner (Section 18-3).
9. Insufficient side yard (Article 19).
10. Insufficient rear yard (Article 20).
11. Set back of parapet (Article 21).



YARD REQUIREMENTS

JOSLIN RESEARCH & CLINICAL EXPANSION
PERMITS AND APPROVALS SCHEDULE

PERMITS/APPROVALS	APPLICATION DATE	HEARING DATE	DECISION/COMPLETION DATE	RESPONSIBILITY
MEPA Review (Executive Office of Environmental Affairs ("EOEA") MEPA Unit)	ENF Filed 7/90	N/A	Certificate issued 8/10	
Historic Review (Massachusetts Historical Commission)	JDC can file now	N/A	30 days after PNF filed; max. 120 days if adverse conditions found	P&D
Architectural Access Variances (Architectural Access Board)	1/91 (if necessary)	3/91 (if necessary)	allow three months	EA
Zoning Approvals (City of Boston Board of Appeal)	11/90	3/91	5/91	EA (bldg. app./zoning comp.); P&D (Bd. of Appeal)
BRA Design Review (Boston Redevelopment Authority ("BRA"))	commenced	N/A	4/91	EA
Parks Approval (Boston Parks and Recreation Commission)	12/90	2/91	2/91	P&D
Trans. Access Plan and Agmt. (Boston Transportation Department)	commenced	N/A	4/91	VHB/P&D
Clinic Expansion Approval (Department of Public Health)	Submit Preliminary Plans (12/90); Submit Final Application and Plans (4/90)	N/A	Comments on preliminary plans are currently issued 12 weeks after receipt of preliminary plans. Administrative practice for final approval is 30 days after submission of final application/plans.	EA
DWPC Sewer Connection Permit (Department of Environmental Protection ("DEP") Division of Water Pollution Control ("DWPC") and Boston Water and Sewer Commission)	At least 120 days in advance of need; obtain BWSC sign-off prior to submittal to DWPC	N/A	allow four months	EA
MWRA Discharge Permit (Massachusetts Water Resources Authority)	to be submitted simultaneously with DWPC application	N/A	allow four months	EA
Cross Connection Permit (DEP-DWPC and Boston Water and Sewer Commission)	BWSC std. form; at least one month prior to hookup	BWSC inspects	within one month after application	EA

Date: 3/91

PERMITS/APPROVALS	APPLICATION DATE	HEARING DATE	DECISION/COMPLETION DATE	RESPONSIBILITY
Building Permit (Inspectional Services Department)	at least 30 days in advance of projected construction start	N/A	allow one month	Contractor/EA
Fire Department Review of Building Plans (Boston Fire Department)	concurrent with Building Permit process	N/A	allow one month	Contractor/EA
Asbestos Removal Notice (DEP, Environmental Protection Agency and U.S. Department of Labor and Industries)	20 days for DEP notice (on std. form); 10 days for DLI/US EPA notices (need to file depends on amounts)	N/A	notice only; no approval	Contractor/EA
Preconstruction Notice (DEP - Air Quality Control)	at least 20 days prior to construction (same form as asbestos notice to DEP)	N/A	notice only; no approval	Contractor/EA
Curb Cut/ Construction Operations Permits (Boston Public Works Department, Public Improvements Commission)	Contractor apply for temp. access/sidewalk use/misc. permits at least one month prior to construction; include plans for any permanent curb cuts.	N/A	within one month	Contractor
Inflammables Storage Permit (Boston Public Safety Committee, Committee on Licenses)	during construction; at least one month prior to installation	N/A	within one month after application	EA

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS

MICHAEL S. DUKAKIS
GOVERNOR

JOHN DEVILLARS
SECRETARY

August 10, 1990

CERTIFICATE OF THE SECRETARY OF ENVIRONMENTAL AFFAIRS
ON THE
ENVIRONMENTAL NOTIFICATION FORM

PROJECT NAME	: Research and Clinic Facility Expansion Joslin Diabetes Center
PROJECT LOCATION	: Boston
EOEA NUMBER	: 8319
PROJECT PROPONENT	: Joslin Diabetes Center
DATE NOTICED IN MONITOR	: July 11, 1990

Pursuant to the Massachusetts Environmental Policy Act (G.L.,c.30,s.61-62H) and Section 11.06 of the MEPA regulations (301 CMR 11.00), I hereby determine that the above project does not require the preparation of an Environmental Impact Report.

The project involves the addition of three stories to an existing building and, if funding permits, a portion of the relocated courtyard will be enclosed for a lounge and dining area for visitors and staff. The project will add approximately 84,000 s.f.

The proponent should continue to work with MASCO on ways to reduce the number of vehicle trips generated by the project and in the area as a whole. The proponent should be commended for the generous subsidy toward T passes offered to employees and for other ways that the institution discourages the use of private autos. The proponent should also make information on public transportation in the Longwood Medical Area available to patients and others who use Joslin. I am confident that the City's ongoing Article 31 process and the required transportation Access Plan and Construction Management Plan can adequately address any remaining transportation issues. In addition, the proponent

100 CAMBRIDGE STREET, BOSTON, MA 02202 (617) 727-9800

should consider incorporating the additional methods for water conservation suggested in the comments of the MWRA in their July 27, 1990 letter. Finally, I expect the proponent to consider the comments of those listed below and incorporate the concerns of these agencies into their ongoing project design work and permit applications.

August 10, 1990
DATE

JOHN DeVILLARS, SECRETARY

Comments received:
City of Boston Environment Department
MAPC
BRA
Boston Water and Sewer Commission
EOTC
MWRA

JPD/JMD/jmd

D:JOSLIN.JMD

City of Boston
The Environment
Department

Raymond L. Flynn
Mayor

Lorraine M. Downey
Director

Boston City Hall/Room 805
Boston, Massachusetts 02201
617/725-4416 or 725-3850

July 30, 1990

RECEIVED
JUL 3 1 1990
MEPA

Mr. John DeVillars, Secretary
Executive Office of Environmental Affairs
100 Cambridge Street, 20th Fl.
Boston, MA. 02202

ATTN: MEPA Unit, EOEA #8319, Research and Clinic Facility Expansion Joslin Diabetes Center, Environmental Notification Form.

Dear Secretary DeVillars:

The City of Boston Environment Department has reviewed the Environmental Notification Form for Research and Clinic Facility Expansion Joslin Diabetes Center and is pleased to submit the following comments:

ENERGY AND WATER USE

We routinely ask that all of the latest energy and water conservation measures available be included in design and future maintenance of new construction. New construction offers the opportunity to update electric and water delivery systems. We encourage full exploration of such opportunities.

SOLID WASTE

We ask that recycling areas be designated in the final design. One of the most difficult problems in implementing recycling programs is locating the necessary storage space for recyclables while awaiting pick-up. After the building is built, it is difficult to find this necessary storage space. For this particular development areas for white office paper storage, cardboard compaction, and glass storage should at a minimum be assigned.

In addition, the hospital should investigate opportunities to include facilities such as glass washing equipment which could allow the Hospital to use reusable glass items in place of disposable plastic items.

The proponents should investigate recycling options for certain hazardous wastes such as batteries, by-products of x-ray development etc.

The concrete waste from initial demolition as well as any clean fill should be used first on site to the extent possible and then recycled at offsite locations to the greatest extent possible.

TRAFFIC

The ENF states that there will be no traffic impact from this project, although there will be an increased number of vehicle trips to the site. In our estimation some further study and mitigation will be required. We understand the Joslin Center is undertaking such a study for the Boston Redevelopment Authority. We assume the study and mitigation will be sufficient.

OPEN SPACE

It is unclear in the ENF to what extent the current courtyard is publicly accessible. When the courtyard is relocated will it offer the same degree of public accessibility? Will an enclosure effectively remove the courtyard from public use, and will that be a significant impact?

The ENF states that only one of fourteen mature trees will be permanently removed. Does this mean 13 mature trees will be physically moved? If so what is the likelihood of their survival? Will funds be available for new tree plantings should the original trees not survive?

In our estimation the impacts of this project are not sufficient to require an Environmental Impact Report. I appreciate this opportunity to comment.

Sincerely,

L M Downey

L. M. Downey, Director

LMD/NS/90

JD

Metropolitan Area Planning Council
60 Temple Place, Boston, Massachusetts, 02111 • 617-451-2770
serving 101 cities and towns in Metropolitan Boston

July 27, 1990

RECEIVED
JUL 30 1990
MEPA

The Honorable John DeVillars, Secretary
Executive Office of Environmental Affairs
MEPA Unit
100 Cambridge Street
Boston, MA 02202

Project Identification

Project Name: Research & Clinic Facility Expansion — EOEA#: 8319
Project Proponent: Joslin Diabetes Center — MAPC: ENF-90-112
Location: Boston — Received: 7/5/90

Dear Secretary DeVillars:

In accordance with the provisions of Chapter 30, Section 62, of the Massachusetts General Laws, the Council has reviewed the Environmental Notification Form identified above and offers the following comments:

1. __X__ Environmental Notification Form adequate; no Environmental Impact Report should be required

2. ____ Before a determination can be made as to whether or not an Environmental Impact Report should be required, additional information should be provided on ( ) probable environmental impacts, ( ) alternatives to proposed action, and/or ( ) measures proposed to mitigate probable impacts.

3. ____ An Environmental Impact Report ( ) should be required, ( ) is categorically required.

4. ____ Additional comments are attached.

Sincerely,

David C Soule

David C. Soule
Executive Director

DCS/CB/lab
cc: Joslin Diabetes Center
Richard Dimino, MAPC Rep., Boston
Paul Reavis, Boston Redevelopment Authority
Carol Baldassari, MAPC Staff

OSTON
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UTHORITY

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) 722-4300

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AUG 1 1990
MEPA

8 1 '90

Secretary John P. DeVillars
Executive Office of Environmental Affairs
100 Cambridge Street
Boston, MA 02202

Attention: MEPA Unit

RE: EOEA # 8319 - Research and Clinic Facility Expansion
(Joslin Diabetes Center)

Dear Secretary DeVillars:

Pursuant to regulations implementing M.G.L., Chapter 30, Sections 62-62H, the Boston Redevelopment Authority has reviewed the above-referenced Environmental Notification Form and submits the following comments.

The proposed project involves the construction of an additional 84,230 square feet of floor area to the existing building of the Joslin Diabetes Center on Brookline Avenue, in Boston's Longwood Medical Area. The new space would be provided by adding three stories to the main wing of the building and by raising an existing courtyard and constructing a treatment center beneath it. The additional space would be used primarily for patient care and research and for administrative purposes.

We do not believe that this project should result in any substantial impacts on the environment. However, we do note that the project could be expected to generate up to 180 vehicle trips per day, but that no additional parking is proposed by the project. Parking is particularly critical in the Longwood Medical Area. The project proponent, therefore, should indicate how and where the parking required by the additional traffic generated will be accommodated.

Since the project site is located in a densely developed medical and hospital area, particular care will need to be taken during the construction period to minimize to the maximum extent possible the emission of dust and other air pollutants and to reduce the generation of construction noise. Appropriate safety measures also must be instituted to protect patients in the existing Joslin facility and pedestrians in the areas surrounding the project and along adjacent sidewalks.

The project proponent has agreed voluntarily to comply with the requirements of Article 31 of the Boston Zoning Code and has submitted a Project Notification Form to the Authority. In addition, a Transportation Access Plan and a Construction Management Plan will be required by the Boston Transportation Department.

Sincerely,

Paul Reavis
Assistant Director for
Engineering and Design Services

cc: Constance L. Stubbs
Administrator
Joslin Diabetes Center, Inc.

JD

Boston Water and Sewer Commission

425 Summer Street
Boston, MA 02210-1700
617-330-9400
Fax 617-330-5167

July 31, 1990

Mr. John P. DeVillars, Secretary
Executive Office of Environmental Affairs
100 Cambridge Street
Boston, MA 02202

RECEIVED
JUL 31 1990
MEPA

Attn: MEPA Unit

Re: Research and Clinic Facility Expansion
Joslin Diabetes Center
Environmental Notification Form
EOEA #8319

Dear Secretary DeVillars:

The Commission has reviewed the Environmental Notification Form for the Research and Clinic Facility expansion by the Joslin Diabetes Center in the Longwood Medical Area. The project will add four stories onto the existing facility. The expansion will create an additional 84,230 square feet of floor area. An increase of 8,600 gallons per day of sewage has been estimated.

The Commission requests that the following information be incorporated in the Draft Environmental Impact Report.

1. Plans showing existing and proposed water, sewer and stormwater pipes should be provided.

2. Water conservation measures beyond those required by the plumbing code should be described in detail.

3. The impact of the proposed project on the Commission's water, sewer and drainage systems should be evaluated.

Thank you for this opportunity to comment on this project.

Yours truly,

John P. Sullivan, Jr., P.E.
Chief Engineer

JPS/PK/mo
cc: Constance L. Stubbs - Joslin Diabetes Center
Stephan Shea - BWSC
P. Joseph Foley - BWSC
Richard M. Kobayshi - MWRA

E.O.T.C. #: 90-0265

THE COMMONWEALTH OF MASSACHUSETTS

EXECUTIVE OFFICE OF TRANSPORTATION AND CONSTRUCTION

(X) E.N.F. :# 8319 ( ) SUPP. D.E.I.R. :#

( ) DRAFT E.I.R. :# ( ) SUPP. F.E.I.R. :#

( ) FINAL E.I.R. :# ( ) TRAFFIC STUDY :#

( ) PROJECT CHANGE: # ( ) OTHER :#

DATE: 07-03-90 DATE RECEIVED: 07-03-90 COMMENTS DUE: 07-31-90

RECEIVED JUL 3 1 1990 MEPA

TOWN/CITY : BOSTON, MASSACHUSETTS

PROJECT PROPONENT : JOSLIN DIABETES CENTER
ONE JOSLIN PLACE
BOSTON, MASSACHUSETTS

PROJECT DESCRIPTION: RESEARCH & CLINIC FACILITY EXPANSION, ONE JOSLIN PLACE, BOSTON, MASSACHUSETTS. The proposed is the completion of the main wing of the facility which was built in 1976 and to raise the existing courtyard from the Brookline Avenue level to the Pilgrim Road level and to construct beneath it a more accessible treatment center for patients with diabetes related eye disease. The entire project will provide an additional 84,230 G.S.F. of floor area for patient care and research, including an 8,200 S.F. mechanical penthouse above the seventh floor. There will be no increase in parking capacity.

COMMENTS: (✓) YES ( ) NO

DATE: 7-30-90

for FREDERICK P. SALVUCCI
SECRETARY

The Commonwealth of Massachusetts
Executive Office of Transportation & Construction
Office of the Secretary
10 Park Plaza, Room 3510
Boston, MA 02116-3969
Telephone 973-7000
TDD (617) 973-7306
Telefax (617) 523-6454

Michael S. Dukakis
Governor
Frederick P. Salvucci
Secretary
and
M.B.T.A. Chairman

EOTC COMMENTS ON THE ENF FOR
JOSLIN DIABETES CENTER EXPANSION
BOSTON, MA
EOEA #8319

EOTC has reviewed the ENF for the expansion of the Joslin Diabetes Center in Boston, MA. The proposed expansion will add 84,230 square feet of patient care and research space to the current 166,240 square foot center. No additional parking will be built. The Joslin Diabetes Center is located at One Joslin Place, on Brookline Street, in the Longwood Medical Area. The project in not categorically included for an EIR.

The traffic generation estimates in the ENF are only 20% to 30% of the values suggested by the ITE trip generation manual. This may in part be explained by Joslin Diabetes Center's location in a downtown area well-served by mass transit; however, the figures are probably an underestimate. We urge the proponent to continue to work with MASCO to reduce the number of vehicle trips in the area, and to consider trip reduction strategies such as transit subsidies and flexible work schedules.

7/30/90
des

MASSACHUSETTS WATER RESOURCES AUTHORITY
Charlestown Navy Yard
100 First Avenue
Boston, Massachusetts 02129

JD 8319

Telephone: (617) 242-6000
Facsimile: (617) 241-6070

July 27, 1990

John P. DeVillars, Secretary
Executive Office of Environmental Affairs
100 Cambridge Street
Boston, MA 02202

Attn: MEPA Unit

Re: EOEA No. 8319-Research & Clinic Facility Expansion ENF, Boston

Dear Secretary DeVillars:

Concerning the above-referenced Environmental Notification Form (ENF), we submit the following comments:

The sanitary flows from the proposed project should be estimated using Title V.

The proposed project will increase wastewater flows to the MWRA Sewer System, parts of which currently lack sufficient capacity to convey wastewater flows without chronic surcharging and overflowing, and to the Deer Island Wastewater Treatment Facility, which currently lacks sufficient capacity to treat wastewater flows during wet weather.

While the additional flows from this project alone would not be expected to significantly increase the frequency of overflows and backups, the development of several projects would increase wastewater flow enough to have an effect on the MWRA system.

The MWRA is in the process of constructing a new wastewater treatment plant which will be fixed in size and limited in capacity. Due to excessive infiltration/inflow in the sewer system, it appears that there will be less than 20 mgd annual flow capacity remaining for future growth. Therefore, the MWRA is concerned about new development and is currently in the process of reducing infiltration/inflow and encouraging communities to do so as well.

As strict adherence to the Massachusetts Plumbing is a requirement and not a mitigation measure, the MWRA suggests the following additional measures in order to minimize water use and wastewater flow:

- <u>Heating and Cooling</u>

  The building heating and air conditioning should be air cooled rather than water cooled. Where water-cooling is necessary the system should be closed loop.

- <u>Sanitary Use/Showers</u>

  Restrooms should be equipped with water saving fixtures such as faucet aerators that use 2.0 gallons per minute or less and spring loaded or timer valves.

- <u>Landscaping</u>

  Landscaping should emphasize the use of water efficient plantings and minimize turf areas.

- <u>Kitchen/Cafeteria Areas</u>

  Kitchen and Cafeteria areas should incorporate water saving techniques and equipment.

In addition to implementing the above-listed water conservation measures, the proponent should consult with the Boston Water & Sewer Commission (BW&SC) to ensure that sufficient capacity exists to accommodate the additional flow from this project and to ensure that this development is consistent with the BW & SC policies, including those concerning Combined Sewer Separation and Infiltration/Inflow Reduction.

If the receiving sewer system is combined, storm and wastewater flows from the project should be conveyed separately as far as possible.

We appreciate the opportunity to comment. Should you have any questions, please do not hesitate to call me at 242-0230, ext. 4804.

Very truly yours,

Katina Belezos

Katina N. Belezos, Project Engineer
Planning Program
Wastewater Engineering

KNB/ve

cc: Libby Blank, BW+SC

RECEIVED

MAR 07 1991

Ellenzweig Associates, Inc

BR+A

March 5, 1991

Mr. Rob Tullis
Ellenzweig Associates, Inc.
1280 Massachusetts Avenue
Cambridge, Massachusetts 02138

RE: **JOSLIN DIABETES CENTER**
Environmental Notification Form

Dear Rob:

Below you will find responses to the various comments on the Environmental Notification Form that pertain to BR+A.

HVAC

The existing building is currently served by MATEP (Medical Area Total Energy Plant) with steam and chilled water for primary heating and cooling. The existing piping mains that serve the building are adequately sized to provide for the additional capacity required for the Facility Expansion. Heating and cooling for the building shall be via closed piping systems.

The HVAC design for the Facility Expansion shall meet the requirements of the pertinent sections of the 5th Edition of the Massachusetts Building Code. This shall include the proper insulation levels on all piping and ductwork systems, economizer cycles on air handling units, retrofit of existing air handling units with new Direct Digital Controls, a new Building Automation System to monitor building energy use, and a heat recovery system for the 100% outside air laboratory air handling units.

The Facility Expansion shall meet the requirements of the Massachusetts State Energy Code. The computer program ENVSTD (Envelope System Performance Compliance Calculation Program) shall be utilized to verify compliance of insulation levels for the facade.

The Facility Expansion shall include steam sterilization of glassware to reduce solid waste. Steam for this purpose is supplied from the same steam main that provides primary heating for the building.

ELECTRICAL

The existing facility receives electrical energy from MATEP with two 13,800 volt, 3 phase primary feeders. These feeders feed a 1,000 KVA double ended unit substation which has adequate capacity required for the Facility Expansion.

The electrical design for the Facility Expansion shall meet the requirements of pertinent sections of the 5th Addition of the Massachusetts State Building Code including Article 31,

Energy Construction, as well as the 1990 National Electrical Code and 1990 Massachusetts Electrical Code.

The lighting will consist of predominantly fluorescent fixtures with minimal use of incandescent lamps. Fluorescent fixtures shall utilize Octron (T8) type lamps with electronic ballasts, currently the most energy efficient combination of lamp and ballast available. An in-house designed computer program will be utilized to verify compliance with Massachusetts State Building Code, Article 31, Energy Conservation, Section 3113, Lighting Systems, using the System Performance Criteria.

If you have any additional questions or comments concerning this matter, please do not hesitate to contact our office.

Very truly yours,

BARD, RAO + ATHANAS CONSULTING ENGINEERS, INC.

Stephen B. Carroll

Stephen B. Carroll

cc: EMB/ABR/DJC/FILE #90-010

SBC/tp

Robert W. Sullivan, Inc.
Consulting Engineers
Unit 302, Union Wharf
Boston, Massachusetts 02109
(617) 523 8227
(Fax) 523-8016
A. Eugeno Sullivan P.E.
Anthony T. DiStelano P.E.
Bahig A. Kaldas P.E.
George H. Minahan
Eugene B. Kingman
Steven P Quioto

March 4, 1991

Ellenzweig Associates, Inc.
1280 Massachusetts Avenue
Cambridge, MA 02138

ATT: Mr. Robert Tullis

RE: Joslin Diabetes Center #3230

Dear Rob:

Reference is made to the Boston Water and Sewer Commission letter dated July 31, 1990 regarding the above project. The following are our comments.

1. Attached is drawing L1.2 Existing Condition Site Plan showing the following existing services:

   a. Storm Drainage

      10-inch to Brookline Avenue
      10-inch to Joslin Road
      8-inch to Joslin Road

   b. Sanitary Sewer

      8-inch to Brookline Avenue
      6-inch to Joslin Road

   c. Domestic Water

      6-inch to Brookline Avenue

   d. Fire Protection Water

      8-inch to Brookline Avenue
      4-inch to Joslin Road

The above existing services are adequate for the new addition and no new services are required.

If you have any questions, please call us.

Very truly yours,

ROBERT W. SULLIVAN, INC.

Bahig A. Kaldas

BAHIG A. KALDAS

BAK:mjh

Enclosure

RWS

Robert W. Sullivan, Inc.
Consulting Engineers
Unit 302, Union Wharf
Boston, Massachusetts 02109
(617) 523-8227
(Fax) 523-8016

A. Eugene Sullivan P.E.
Anthony T. DiStefano P.E.
Bahig A. Kaldas P.E.
George H. Minahan
Eugene B. Kingman
Steven P. Quieto

March 4, 1991

Ellenzweig Associates, Inc.
1280 Massachusetts Avenue
Cambridge, MA 02138

ATT: Mr. Robert Tullis

RE: Joslin Diabetes Center #3230

Dear Rob:

Reference is made to the City of Boston Environment Department letter dated July 30, 1990 regarding the above project. The following are our comments.

1. Regarding energy and water use, the project will be designed as required by the latest Massachusetts Plumbing code which indicates the water use for different plumbing fixtures. Plumbing equipment shall be the energy saving models. The following are some of the reuqirements which shall be included in the design:

   a. Conservation of Cold Water

      All water closets shall be low consumption toilets which use maximum 1.6 gallons per flush. All urinals shall use maximum 1.0 gallon per flush.

   b. Conservation of Hot Water

      Showers shall be equipped with approved flow control devices to limit total flow to a maximum of 3 gallons per minute per shower head.

      Lavatories in rest rooms of public facilities shall be equipped with outlet devices which limit the flow of domestic hot water to a maximum of 0.5 gallons per minute, a maximum of 110°F temperature, and with metering faucets that limit delivery to a maximum of 0.25 gallons of hot water.

2. Regarding the open space, wall hydrants shall be provided for watering the trees.

If you have any questions, please call us.

Very truly yours,

ROBERT W. SULLIVAN, INC.

Bahig A. Kaldas

BAHIG A. KALDAS

BAK:mjh

LeMessurier Consultants

1033 Massachusetts Avenue, Cambridge, MA 02238
617/868-1200 Fax: 617/661-7520

5 December 1990

RECEIVED

DEC 07 1990

Ellenzweig Associates, Inc.

Mr. R. Tullis
Ellenzweig Associates
1280 Massachusetts Avenue
Cambridge, MA 02138

Reference: Joslin Diabetes Center - Addition
LeM File No. 90002

Dear Rob:

Per your request, we have reviewed the government agencies' responses to the Joslin Institutional Master Plan. The following is summary of the structural impact and required action.

1. The Commonwealth of Massachusetts, Executive Office of Environmental Affairs:

   No structural impact.

2. City of Boston, The Environment Department:

   Solid waste: We are assuming that white office paper storage will not exceed the design live load of 100 psf. Paper weighs 58 pounds per cubic foot. If you anticipate more than 2000 pounds of paper to be stored (34.5 cu.ft.) then you should let us know. We are also assuming that the recommended glass washing equipment will not exceed the 100 psf typical live load or 150 psf new 6th floor equipment room live load. Please let us know if this is not the case. We do not anticipate any locations where waste concrete or clean fill could be used on site.

3. Metropolitan Area Planning Council:

   No structural impact.

4. Boston Redevelopment Authority:

   Paragraph 4 addresses various construction concerns; the contractor should be informed of these issues.

5. Boston Water and Sewer Commission:

   No structural impact.

6. The Commonwealth of Massachusetts, Executive Office of Transportation and Construction:

   No structural impact.

7. Massachusetts Water Resources Authority:

   No structural impact.

Very truly yours,
LeMessurier Consultants

Kelly West

D. Kelly West

DKW:pwpw02055.ltr

xc: A.Lewis/LeM

1) Project area Owner: Joslin Diabetes Center, Inc.

2) Displacees: None

3) Abutters:

Children's Hospital
Rudman Ham
Vice President for Operations
Colleen O'Loughlin
Director of R.E. Operations
300 Longwood Avenue
Boston, MA 02115

Galleria on Longwood
350 Brookline Avenue

Corcoran Management Company, Inc.
128/South Suite 205
100 Grandview Road
Braintree, MA 02184

Apartment Buildings
374 Longwood Avenue

Dana-Farber Cancer Institute
John W. Pettit
Chief Administrative Officer
44 Binney Street
Boston, MA 02115

Medical Area Service Corporation
Rick Shea
Vice President of Planning
333 Longwood Avenue
Boston, MA 02115

MASCO Garage Project
375 Longwood Avenue

New England Deaconess Hospital
Albert B. Washko
Executive Vice President
185 Pilgrim Road
Boston, MA 02215

Stephen C. Ullian
Trustee of Ullian Realty Trust
127 Jordan Road
Brookline, MA 02146

Ullian Building
Longwood & Brookline

Winsor School
Ms. Carolyn Peter, Head Mistress
Pilgrim Road
Boston, MA 02215

Director of Project Management
Division of Capital Planning & Operations
100 Nashua Street (5th Floor)
Boston, MA 02114

Beth Isreal Hospital
Frank Sullivan, Director of Facilities
Libby Building, J-240
330 Brookline Avenue
Boston, MA 02215

Mass. College of Art Bldg.
360 Brookline Ave.

4) Community Groups:

Mission Hill Planning
Kelly Farquarson, Chairperson
17 Wigglesworth Street
Boston, MA 02120

Communications With Interested Parties

1) The attached letter of explanation was sent to every tenant of the adjacent apartment building on Longwood Avenue in September 1990 with a follow-up to new tenants in October.

2) Similar letters will be sent to commercial tenants of the Ullian Trust and Joslin in March 1991.

3) The plans were presented at a meeting sponsored by MASCO for Longwood Area planners and facilities directors. Conversations with staff at area institutions have been on-going.

4) Plans were presented to the Winsor School at a meeting with the head mistress on November 27, 1990.

5) Plans were presented to the Mission Hill PZAC on October 2, 1990. On that occasion the PZAC held its meeting at Joslin.

Joslin Diabetes Center

Dedicated to Diabetes Research, Treatment, Education, and Youth Programs

One Joslin Place
Boston, Massachusetts 02215

(617) 732-

September 14, 1990

Dear

The Joslin Diabetes Center is planning to do a construction project. I am writing to tell you about the project and to make myself available to you if you want to know more about it. The new space will be used for Joslin's only mission: the study and treatment of diabetes.

We are ready to complete the building on Brookline Avenue. The wing was designed for seven stories, but only four were built at the time of construction in 1976. (You may have noticed that the elevator tower goes up seven stories.) The plan is to add the remaining three stories now.

A site plan of our block is enclosed. It shows where the addition will be. The surface parking lot on Longwood Avenue will stay as it is. The retail space on Brookline Avenue will remain. The court yard will be raised one level so that it is even with Pilgrim Road. If funds are available, we will enclose part of the new court yard to create a glassed-in space for use in winter. We have carefully designed the exterior and enclosed court yards so as to maintain privacy for the apartments facing our way.

We are in the planning phases now. Actual construction will not begin before next summer. Joslin staff will continue to work in the space during construction so we share your strong desire to minimize noise and congestion during the building phase.

I would be happy to show the plans to anyone who is interested. Please call my office (732-2656) if you have questions. Best regards.

Sincerely,

Connie Stubbs

Constance L. Stubbs
Administrator

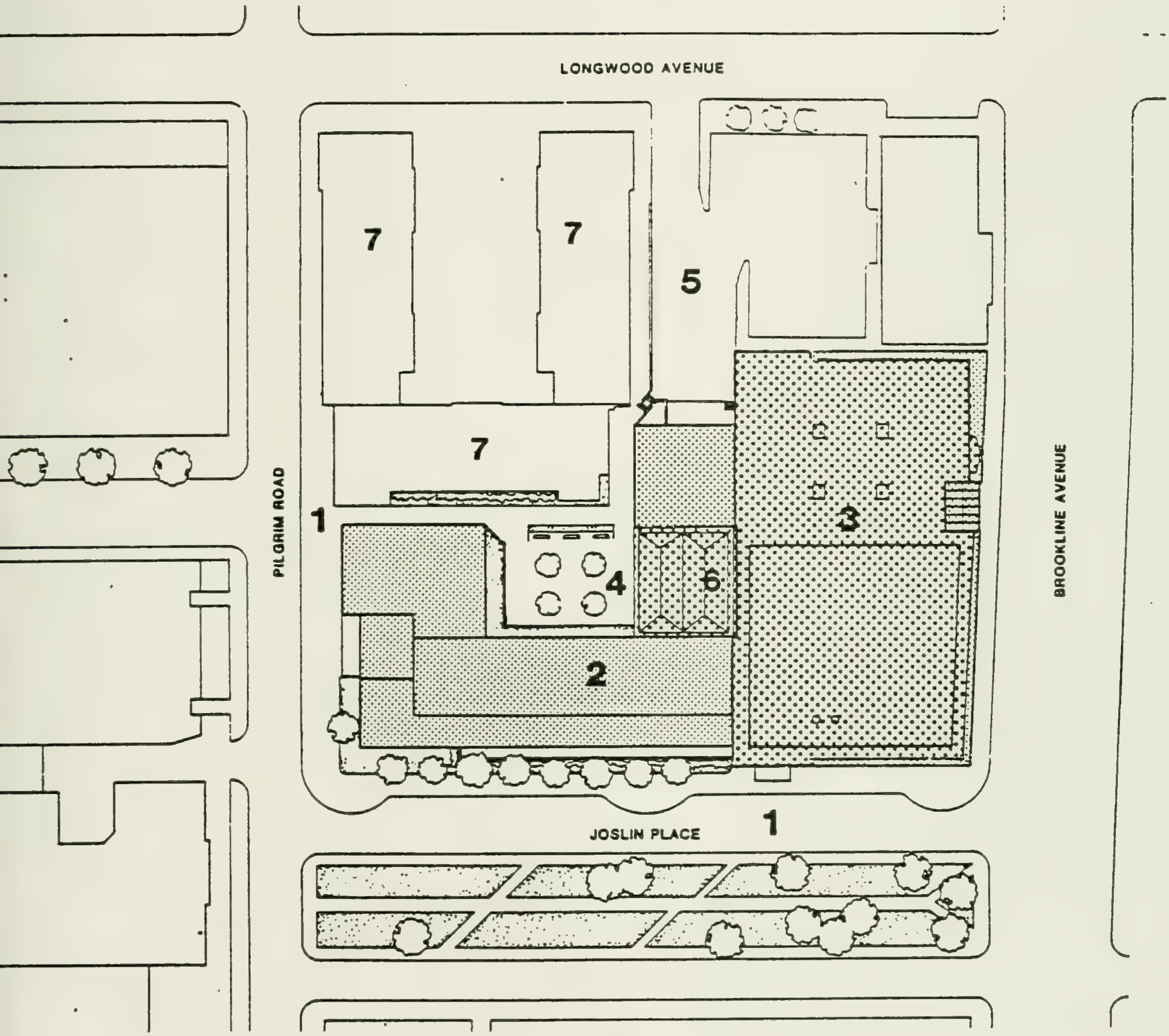
Site plan

1. Entrance
2. Existing facility
3. New addition
4. New courtyard
5. Parking lot
6. Enclosed Courtyard
7. Apartment Building

Proposed

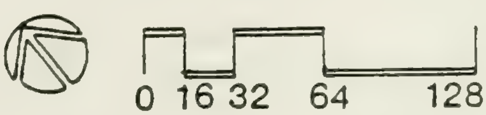
Existing

Apartment Building



PROPOSED SITE PLAN

Facility Expansion
Joslin Diabetes Center



Ellenzweig Associates, Inc.
Architects

Transportation Component B

A Transportation Access Plan for the proposed project has been prepared by Vanasse, Hangen, Brustlin Inc. and is presented on the following pages.

The key elements of an Access Plan Agreement have been discussed by the Boston Transportation Department and Joslin. Those commitments are included in a letter at the end of this section.

TRANSPORTATION ACCESS PLAN

JOSLIN DIABETES CENTER
RESEARCH AND CLINIC FACILITY EXPANSION
Boston, Massachusetts

Prepared for:

Joslin Diabetes Center
One Joslin Place
Boston, Massachusetts 02215

Prepared by:

Vanasse Hangen Brustlin, Inc.
Engineers, Planners, and Scientists
101 Walnut Street
P.O Box 9151
Watertown, Massachusetts 02272

March 1991

2581/391/
TPR-BN3

Contents

Introduction and Summary

THE PROJECT

Joslin Diabetes Center (JDC), the nation's leading institution for diabetes research and treatment, is located in Boston's Longwood Medical Area on a 1.3-acre site bounded by Brookline Avenue, Longwood Avenue, Pilgrim Road, and Joslin Place. The project site location is shown in Figure 1. It should be noted that the Joslin has recently opened a satellite facility on Route 9 in Framingham to make care accessible for patients without traveling into Boston. Joslin's main wing in Boston was built in 1976, its structural elements and elevator tower were built to accommodate seven stories, but, due to funding constraints, only the first four were initially constructed. Having outgrown its existing facilities, Joslin now proposes to complete the main wing by constructing a vertical expansion.

Joslin proposes also to raise its existing courtyard from the Brookline Avenue level to the Pilgrim Road level and to construct beneath it a more accessible treatment center for patients with diabetes-related eye disease. If funding permits, a portion of the relocated courtyard will be enclosed to create a lounge and dining area for visitors and staff.

The entire project will provide an additional 72,350 FAR square feet for patient care and research. A mechanical penthouse is planned for the area above the seventh floor. Planned use of the new space is not significantly different from existing uses. As a transportation mitigation measure, no new on-site parking is proposed. The project's parking needs will be accommodated at nearby facilities, particularly the MASCO Mixed Use Development at 375 Longwood Avenue.

TRANSPORTATION ACCESS PLAN

This Transportation Access Plan describes the area transportation system, Joslin Diabetes Center's use of that system now and in the future, and Joslin's plan for minimizing any potential adverse impacts on transportation conditions. The material presented in this chapter is derived from a 1990 survey of Joslin Diabetes Center patients and staff and an extensive study[1] completed in 1988

1/ Longwood Medical Area Transportation Study; Vanasse Hangen Brustlin, Inc. Technical Memorandum #1 (November 1987), Technical Memorandum #2 (April 1988), and Technical Memorandum #3 (May 1988).

Vanasse Hangen Brustlin, Inc.

Site Location Map

Figure 1

by Vanasse Hangen Brustlin, Inc. (VHB) and the Medical Area Service Corporation (MASCO). The latter study, funded entirely by MASCO members including Joslin, ultimately led to the formation of CommuteWorks, a Transportation Management Organization dedicated to fostering and coordinating the many traffic management programs offered to and by MASCO's member institutions.

The report is divided into several sections, as follows:

- The first section describes the area transportation characteristics, including traffic, public transportation, parking, and pedestrian conditions.
- The second section describes Joslin Diabetes Center's existing and forecast travel patterns. The year 1993, the target date for project completion, was selected as the analysis year in the Master Plan and used again in this document for consistency.
- The third and final section describes the Joslin's transportation mitigation plan, which is designed to improve transportation system operations through system improvements and travel demand.

The study described herein was conducted for the JDC by Vanasse Hangen Brustlin, Inc. (VHB), based on a scope approved by the Boston Transportation Department (BTD) and the Boston Redevelopment Authority (BRA).

STUDY AREA

The study area was defined by the Boston Transportation Department (BTD) in the scoping determination for this project. The intersection of Brookline Avenue and Longwood Avenue, and the intersection of Longwood Avenue and Riverway were analyzed for traffic impacts.

SUMMARY OF FINDINGS

The Joslin Diabetes Center has proposed the construction of a 72,350 FAR square foot addition to its existing building located on a 1.3-acre site bounded by Brookline Avenue, Longwood Avenue, Pilgrim Road and Joslin Place. No new on-site parking will be constructed. Instead, the nearby MASCO 375 Longwood Avenue project is expected to accommodate the new project parking needs. The Joslin is the nation's leading institution for diabetes research and treatment and has planned this project to allow for expanded research activities and to create a new treatment area for eye patients. This Transportation Access Plan (TAP) describes the area transportation system, the JDC's use of that system now and in the future and the Joslin's mitigation plan for minimizing any potential adverse impacts.

Traffic

The project is expected to generate approximately 180 net new daily vehicle trips (90 arriving and 90 departing the site), of which approximately 20 are expected in the morning peak hour, while about 16 are expected in the evening peak hour. Two intersections near the project site were analyzed for traffic impacts. The analysis concluded that while there are both existing and future operational deficiencies projected, project traffic is not expected to have a noticeable impact on existing traffic conditions. Traffic deficiencies under No-Build and Build conditions in 1993 are largely due to the cumulative impacts from background traffic growth and from developments in or near the Longwood Medical Area. The traffic growth conditions at both intersections can be improved however. At the Riverway and Longwood Avenue intersection, signalization improvements, adjusting signal timing and phasing, coordinating the signals with adjacent intersections in Brookline, and modifying the pedestrian crossing pattern are all under consideration by MASCO. At the Longwood Avenue intersection with Brookline Avenue, an additional approach lane is proposed as part of Beth Israel Hospital's Clinical Center project.

Parking

The 180 net new daily vehicle trips are expected to create a net new peak parking demand for 40 to 42 spaces, which includes 26 staff and 14 to 16 patient spaces. Because no new on-site parking is proposed, most of the new staff parking is expected to be accommodated in parking facilities at the MASCO Mixed Use Development at 375 Longwood Avenue. The Joslin has been assigned 34 monthly spaces in this facility. The patient-related parking is also expected to be accommodated nearby, either at the same 750-space MASCO garage, within the 110 designated turnover spaces which are located there, or at the nearby Deaconess Garage.

Public Transportation

The project site is located within the vicinity of six bus routes and two light rail lines. They include MBTA bus routes 8, 39, 47, 60, 65 and 66 and the D (Riverside) and E (Arborway) branches of the MBTA's Green Line. MASCO also operates a shuttle (Route M2) to Harvard Square in Cambridge and shuttles to off-site parking facilities which are located in the Fenway and Kenmore Square areas. The project is expected to generate approximately 44 net new transit trips daily, including about 15 in the morning peak hour and about 15 in the evening peak hour. When distributed among the various transit routes serving the site, these new transit trips are not expected to have a noticeable effect on public transportation conditions.

Construction

Joslin is committed to working closely with the City to develop an acceptable construction mitigation plan. Because the project does not require new land and simply adds planned floors to an existing building, the construction impacts will be less than for a totally new development. The project is expected to employ an average of 52 construction workers per day and to involve 225 different tradespeople over the construction period. To encourage the promotion of work

opportunities to members from adjacent neighborhoods, particularly Mission Hill, the General Conditions will specify that the Contractor shall visit the Business Agent of each trade union involved. A set of specific construction mitigation commitments have been identified and incorporated in this Transportation Access Plan. Three specific measures related to construction worker travel that should be noted include:

- Participation of construction workers in MASCO's rideshare information program.
- MBTA transit subsidies for construction workers.
- Use of existing available off-site MASCO parking for those construction workers who choose to drive. This parking is accessible via frequent shuttle bus service to the LMA.

Mitigation

A comprehensive transportation mitigation program has been developed by the Joslin Diabetes Center to respond to the City's Transportation Access Plan requirements. The goal was to identify mechanisms and procedures to reduce the number of vehicles used for commuting to the site. The specific measures that are contained in the plan include the following:

- The JDC has already begun implementing many elements of the mitigation program. In particular, the Joslin has recently opened a satellite facility on Route 9 in Framingham to make care accessible for patients without traveling into Boston.
- Increased staff parking needs created by the project will be accommodated off site, primarily at the MASCO Mixed Use Development at 375 Longwood Avenue and the patients will be accommodated either at 375 Longwood or in the Deaconess Garage.
- Parking fees will be kept higher for on-site parkers after they are raised on April 1 in an attempt to discourage people from driving alone to the site.
- Joslin is introducing a new, unique daily voucher program to allow staff with parking privileges to use alternate transportation without losing the right to park on site.
- The JDC will continue to sell MBTA passes through payroll deduction at a 25-percent discount to its employees.
- The JDC will continue to participate in and support MASCO's CommuteWorks program, including its centralized ridesharing matching service. This includes the promotion of CommuteWorks and information on commuting alternatives.
- The use of alternative work schedules already occurs to the extent possible at the Joslin and will continue to be used in the future to help spread peak period traffic impacts.

- Implementation of roadway improvements is normally within the purview of MASCO and the JDC will continue to support efforts to upgrade traffic operations at area intersections.

- The Joslin and its architects have been working with the Boston Redevelopment Authority (BRA) so that the project is designed with an eye toward accommodating pedestrian needs without compromising security needs.

The measures outlined above are expected to be incorporated within a Transportation Access Plan Agreement (TAPA) between the Joslin Diabetes Center and the Boston Transportation Department (BTD).

Existing Conditions

TRAFFIC

The existing roadways within and adjacent to the study area consist of both local and arterial streets. Roadways in the study area traverse an urban environment influenced in part by the hospitals, schools, colleges of the Longwood Medical Area (LMA), and a mix of commercial and residential land uses. Roadway characteristics and traffic volumes were compiled to analyze existing conditions.

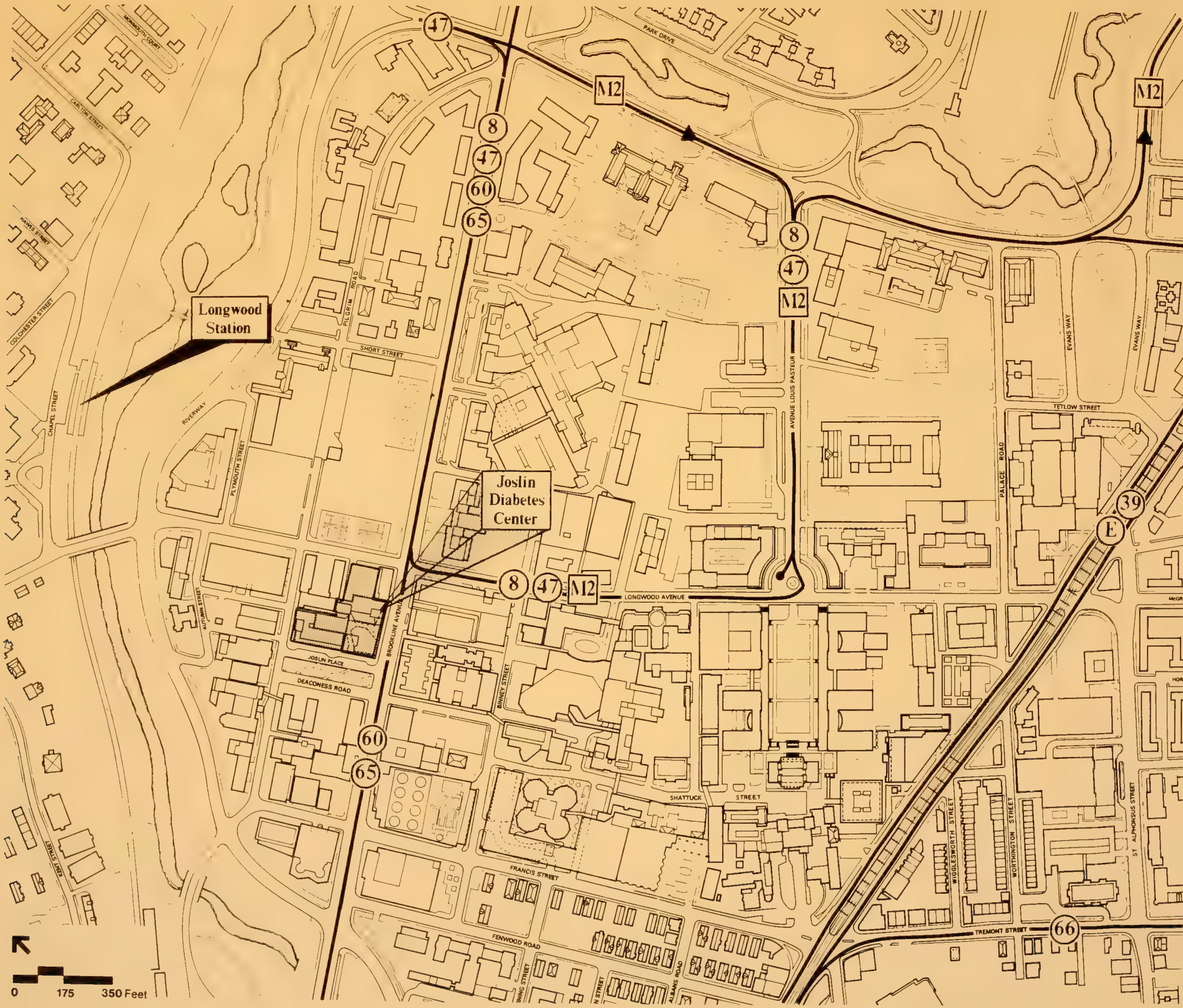
Area Transportation System

The area's streets and public transportation routes are shown in Figure 2. Three arterials and three local streets exist in the immediate vicinity:

Arterials

- Brookline Avenue, a north-south arterial connecting Kenmore Square with Brookline Village, carries 28,000 vehicles daily and approximately 1,700 during the peak hour. The avenue is 59 feet wide, with two travel lanes and one metered parking lane in each direction. In August, 1990, with the approval of the Boston Transportation Department, MASCO removed a number of meters in the vicinity of Joslin Diabetes Center and restriped a portion of Brookline Avenue from four to five lanes to provide exclusive left-turn lanes at signalized intersections.

- Longwood Avenue, an east-west arterial connecting Huntington Avenue in Boston with Harvard Street in Brookline, carries 8,000 vehicles daily and approximately 600 during the peak hour on the segment adjacent to Joslin Diabetes Center. East of Brookline Avenue, Longwood Avenue traffic volumes are about 50 percent greater. The avenue is 34 feet wide, with one travel lane in each direction and one metered parking lane on the south side of the street. Parking meters were also removed along most of the street between the Riverway and Huntington Avenue and the roadway was restriped from two to three lanes to provide exclusive left-turn lanes at signalized intersections. Joslin's only driveway is on Longwood Avenue. This driveway provides access to the service yard, which has a loading dock and can accommodate parking for up to 34 cars.



Vanasse Hangen Brustlin, Inc.

Figure 2

Area Transportation System

- The Riverway, a north-south parkway connecting the Fenway/Kenmore area with Jamaica Plain and points south, carries 30,000 vehicles daily and about 2,100 during the peak hour. The Riverway's width varies between 44 and 60 feet, with parking provided on the east side of the wider section. Two through lanes are provided in each direction.

Local Streets

- Pilgrim Road, a one-way southbound local street running from Longwood Avenue to Francis Street, is used almost exclusively for local access to the New England Deaconess Hospital (NEDH) and Joslin Diabetes Center (JDC). It is about 24 feet wide, provides parking on one side, and carries about 2,700 vehicles daily and about 200 during the peak hour.

- Joslin Place, a one-way westbound local street running from Brookline Avenue to Pilgrim Road, is also used almost exclusively for local access to NEDH and JDC. It is about 30 feet wide, providing a single travel lane, metered parking on both sides, and a drop-off area at Joslin's main entrance. Estimated traffic volumes are 1,100 vehicles daily and 80 during the peak hour.

- Deaconess Road, a one-way eastbound local street, runs from Pilgrim Road to Brookline Avenue, beyond which it continues for one block as a two-way local street. The section west of Brookline Avenue is also used almost exclusively for local access to NEDH and JDC. That section is about 36 feet wide, with a 20-foot travel lane and metered parking on both sides. Traffic volumes are approximately 1,200 vehicles daily and 100 during the peak hour.

Existing Traffic Volumes

Morning (7:15 AM to 9:15 AM) and evening (4:00 PM to 6:00 PM) peak period traffic turning movement and vehicle classification counts were obtained from previous counts at the intersections of Longwood Avenue with:

- Brookline Avenue

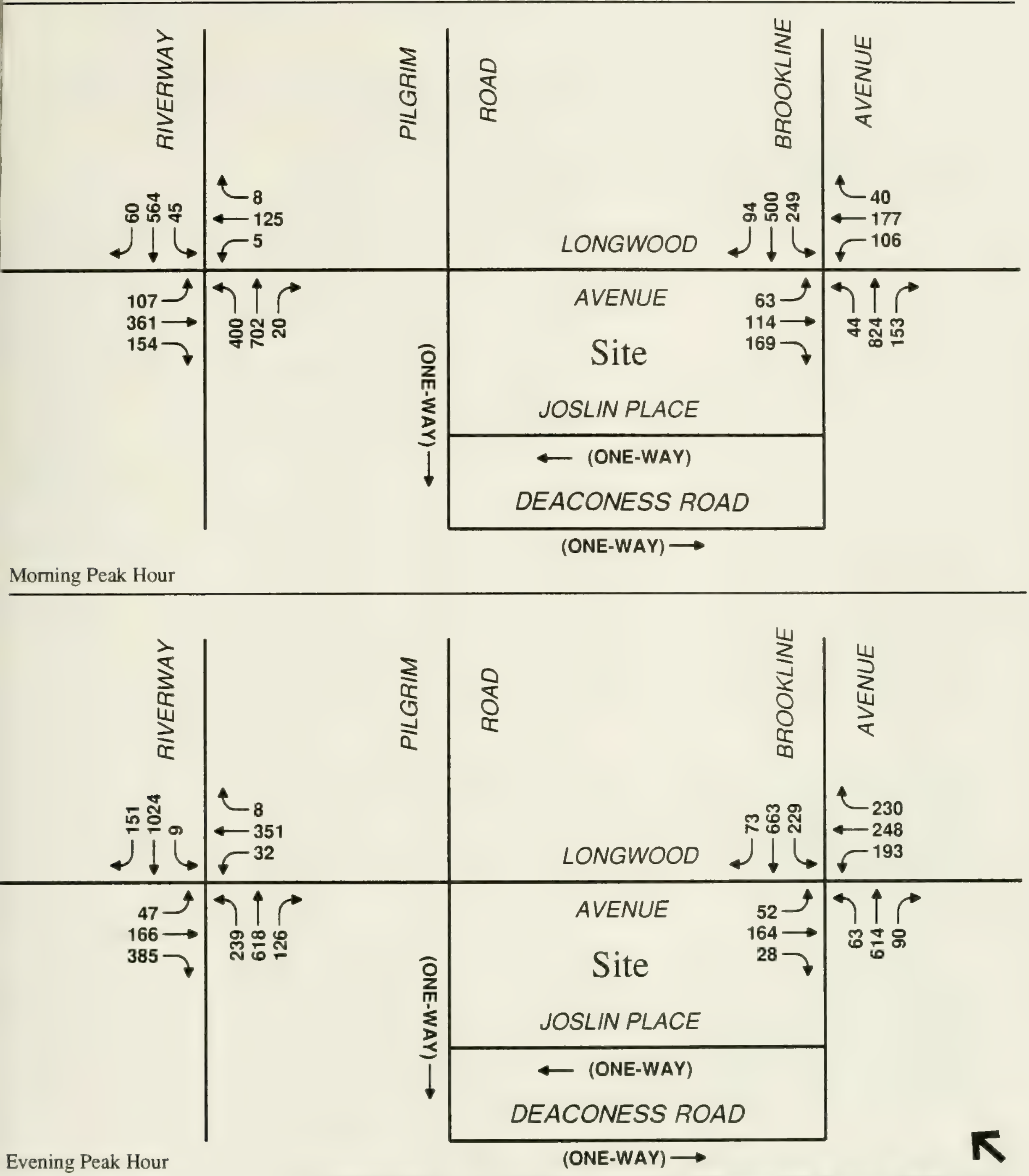
- Riverway

The morning and evening peak hour volumes are presented in Figure 3. Automatic traffic recorder (ATR) counts were recently conducted by the Brigham and Women's Hospital, for a period of 24 hours to identify traffic patterns through the course of the day, during the same week on:

- Brookline Avenue (north of Francis Street)

- Riverway (north of Francis Street)

The average weekday daily traffic volumes at these locations are presented in Table 1 along with 1987 data for Longwood Avenue. Volumes on Longwood Avenue are consistently in the range of 500 to 600 vehicles per hour or more between 7:00 AM and 6:00 PM.



Vanasse Hangen Brustlin, Inc.

Existing Traffic Volumes

Figure 3

Table 1 **EXISTING TRAFFIC VOLUMES**

Location	AWDT	Morning Peak Hour	Percent of AWDT	Evening Peak Hour	Percent of AWDT
Brookline Avenue north of Francis Street*	28,301	1,794	6.3	1,909	6.7
Riverway north of Francis Street*	28,852	2,088	7.2	2,235	7.7
Longwood Avenue**	7,620	625	8.2	615	8.1

* Counts conducted on September 26, 1990.
** Counts conducted in April, 1987.

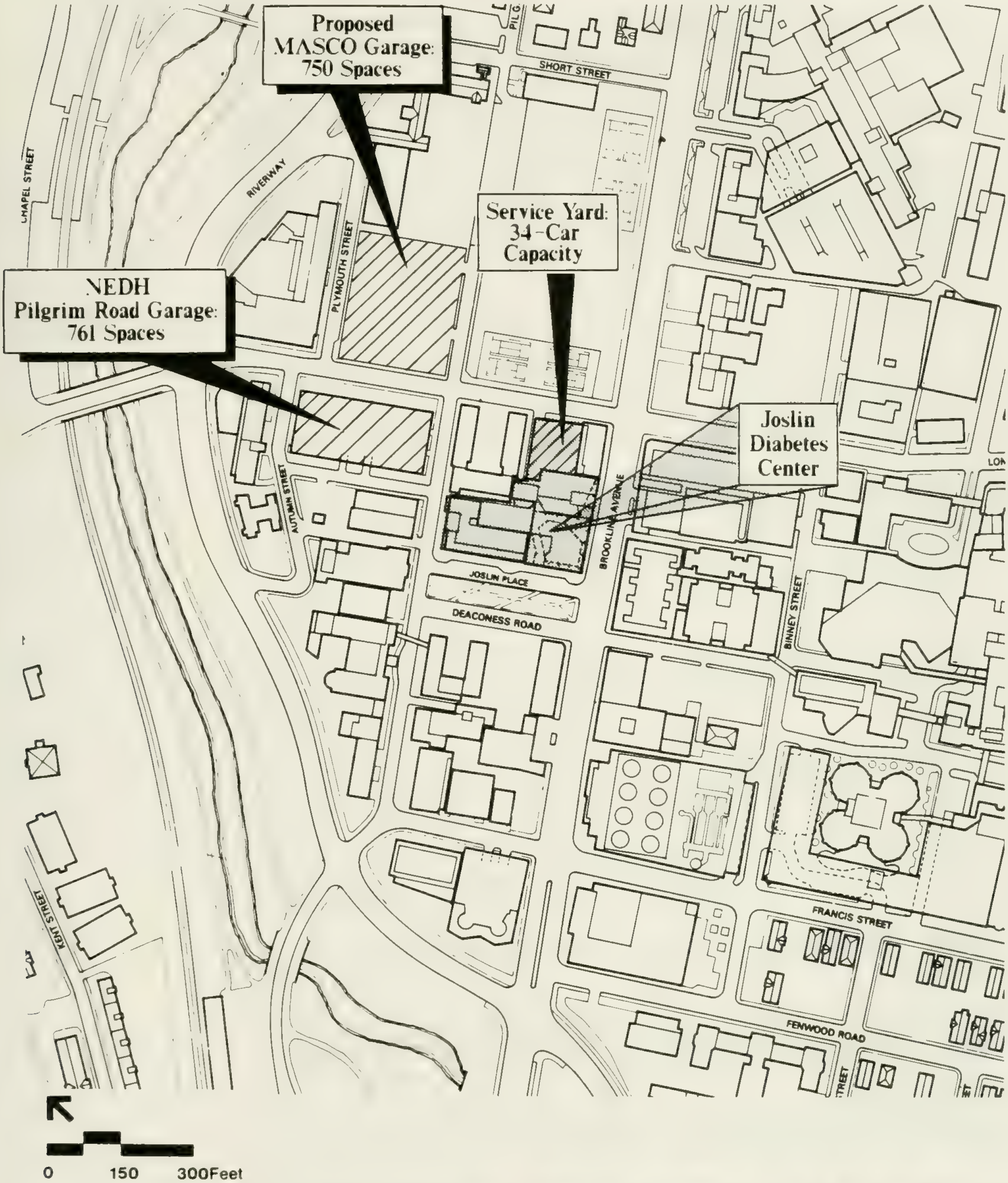
PARKING

Joslin Diabetes Center's parking supply is constrained by the fact that the service yard is the only on-site source of parking. A valet system is used in the service yard to maximize capacity. The yard is striped for 14 tandem spaces (i.e., space for 28 cars) and can hold up to 34 vehicles when one lane of the driveway is used for parking. A total of 44 parking stickers have been issued, allowing people to park in the service yard. Most of these are issued to staff because the access to the building is from the loading dock and is not suitable for patients. Figure 4 indicates the parking supply serving the site.

There is some slight variation in the availability of and demand for off-site parking to support the Joslin. At the time the Master Plan was prepared, Joslin leased 105 off-site spaces. Of these, 87 are located in the Pilgrim Road Garage, owned by the New England Deaconess Hospital (NEDH), and another 2 spaces are in a nearby lot on the NEDH campus. The remaining 16 spaces are approximately one-half mile from the Joslin; 13 spaces in a lot on Peterborough Street and 3 in a lot on Boylston Street. Shuttle service is provided to and from these locations.

When the Institutional Master Plan was was prepared, 149 staff parking stickers were in use. The 44 parking permits valid at the service yard and the 89 permits valid at the nearby NEDH facilities all carry a monthly fee of $80, which is deducted from paychecks. The 16 staff members who park in remote lots pay a $60 monthly fee, which includes shuttle transportation. It should be noted that the JDC intends to increase its parking fees effective April 1, 1991. The increased rates will maintain the current relationship between on- and off-site parking costs.

Joslin is not able to accommodate any patient parking on site. In the survey conducted for the Master Plan, most patients (69%) use the Pilgrim Road Garage, which is open to the public. The second most popular location reported was the 110 Francis Street Garage at 11 percent. Other off-street parking facilities accounted for two (2) percent of the patient parkers. Fourteen (14) percent of the patients indicated they park in on-street metered spaces and 4 percent were in unmetered spaces. With 200 patients per day, approximately 36



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Near-By Parking Facilities

Figure 4

lines. Service on the portion of the line between Heath Street and the Arborway (adjacent to Forest Hills Station in Jamaica Plain) was suspended five years ago and replaced temporarily with Bus Route 39. Streetcars on the E branch typically operate at 5- to 10-minute intervals.

- The Riverside (D) branch of the MBTA Green Line runs from downtown Boston to Riverside Station in Newton, with a stop at Longwood Station, just over one-quarter mile from the Joslin Diabetes Center. The downtown stations provide connections to other rapid transit and commuter rail lines, while the outlying stations offer park-and-ride facilities to serve residents of more distant suburbs. Service typically operates at 5- to 10-minute intervals. The MBTA is currently upgrading the Riverside Line power system to allow extensive use of three-car trains during peak hours.

The scheduled capacity on all these routes is generally adequate for the number of passengers carried. However, a number of factors, including area traffic congestion, sometimes prevent scheduled service from being delivered. This results in overcrowding on some vehicles during peak periods. It is expected that planned improvements to the power system on the Green Line and the recent improvements to traffic flow conditions on area streets will help reduce the incidence of overcrowding on area public transportation routes.

The Medical Area Service Corporation (MASCO) operates a shuttle (Route M2) to Harvard Square in Cambridge. This route may be boarded at the intersection of Longwood Avenue and Avenue Louis Pasteur, less than one-quarter mile from the project site. MASCO also operates shuttle bus service to off-site parking facilities which are located in the Fenway and Kenmore Square areas.

PEDESTRIANS

Since relatively few travelers to Joslin Diabetes Center park on the site, the pedestrian system is an important part of the area transportation network. Sidewalks and crosswalks are an integral part of the journey for persons who park off site, travel by public transportation, or make the whole trip on foot.

In general, the area pedestrian system is well developed, with sidewalks on both sides of nearly all streets, crosswalks at most intersections, and exclusive pedestrian crossing phases at all traffic signals. The proposed Research and Clinical Facility Expansion project will address Joslin's own concerns about the clarity of pedestrian paths to the site and pedestrian circulation on the site.

It is a project goal to strengthen the definition of the main entrance on Joslin Place and enhance the pedestrian environment by clearly defining the drop-off area at the entrance and improving the site signage. There are presently three (3) pedestrian access routes to the main reception area on the second floor:

1. From Pilgrim Road, through the exterior alley, up an exterior ramp, to the second floor entrance.

2. From Joslin Place, through the exterior passageway, down an exterior ramp into the first floor entrance lobby or up the exterior courtyard stairs to the second floor entrance.

3. From Brookline Avenue, through the retail area and into the first floor entrance lobby or up the exterior courtyard stairs to the second floor entrance.

The proposed project will retain the main reception area on the second floor and have the following effect on these existing pedestrian routes:

1. Will remain the same.

2. Will be enclosed and improved.

3. Will be rerouted to the main entrance on Joslin Place.

The Courtyard currently at the Brookline Avenue level is being raised to the Pilgrim Road level and the pedestrian access through the site to Pilgrim Road will be relocated to Joslin Place. The existing public retail space on Brookline Avenue will be maintained.

Probable Project Impacts

TRAFFIC IMPACTS

Institutional Travel Patterns

This section describes Joslin Diabetes Center's use of the transportation system. It focuses on Joslin as a clinical and research organization. The small retail establishments which rent space from Joslin are not included here because they are not institutional uses. Moreover, these establishments place little demand on the transportation system because they mainly serve people who are already in the area for another purpose. In fact, a 1985 survey taken in the immediate vicinity showed that only 5 percent of weekday customers at area retail establishments traveled to the area just to shop.[2]

Accounting for normal absences and vacations, 200 patients and 314 staff members travel to and from Joslin Diabetes Center on a typical weekday. Joslin expects that, five years from now, these figures will grow to about 266 patients and about 366 staff members. The total work force is expected to grow from 350 F.T.E.'s (full-time equivalents) to 410 F.T.E.'s in Boston over the next five years.

In March and April, 1990, Joslin conducted comprehensive patient and staff surveys to determine existing travel patterns. Sample sizes were 156 patients and 189 staff members. The number of surveys received compared with the number of persons present on a typical weekday was 78 percent for patients and 60 percent for staff. The staff survey was disaggregated according to the job categories used by CommuteWorks, and the responses were weighted to ensure that all job categories were proportionally represented.

The surveys revealed that 75 percent of Joslin's patients arrive in an automobile which is parked in the vicinity during the patient's appointment. An additional 11 percent are dropped off by automobiles and taxicabs whose drivers return home or continue to another destination. The remaining 14 percent arrive by MBTA or on foot.

Approximately 55 percent of Joslin staff members commute by automobile. Another 35 percent use the MBTA or the MASCO shuttle from Cambridge. The remaining 10 percent walk or bicycle to work.

2/ Vanasse Hangen Brustlin, Inc., "Longwood Galleria Project," Traffic Impact Study Memorandum, June 1985.

The staff survey breakdown by job category is presented in Table 2. (The Joslin staff is so small that three categories each had fewer than three responses, too few to be statistically valid for disaggregate analysis.) As expected, automobiles are used for commuting by most registered nurses, physicians, and administrators, but by only one-quarter of ancillary nurses, research investigators, and intern/resident/fellows.

Daily and Peak Hour Vehicle Trips

Existing and future vehicle-trip generation estimates were estimated from the survey results (see Table 2). Approximately 360 vehicles, including 194 patient vehicles and 166 staff vehicles, travel to Joslin Diabetes Center on a typical weekday. The 194 patient vehicles include automobiles and taxicabs arriving to pick up patients, and the 166 staff vehicles include those without Joslin parking permits. Of all 720 daily vehicle trips (360 arriving and 360 departing), 106 occur during the morning peak hour, and 99 occur during the evening peak hour.

Assuming that existing travel patterns continue, the planned growth in patient volume and staff size will result in only a small increase in traffic generation. An additional 90 arriving and 90 departing vehicles, or 180 net new vehicle trips per day are anticipated. Of these, 20 are expected to occur in the morning peak hour, and 16 are expected during the evening peak hour. No noticeable impact is anticipated from these small additions to the traffic stream, which are summarized in Table 3.

The additional vehicle-trip generation may actually be less than the estimates presented above, for two reasons. First, no new on-site parking is to be provided. Driving to work becomes a less attractive choice when parking is off site. As driving becomes less convenient, the percentage of staff members driving to work is likely to decline.

Second, Joslin has begun to work closely with CommuteWorks on strategies to reduce automobile use by staff members. Some of these techniques are discussed at the conclusion of this chapter.

Table 2 COMMUTING MODE OF STAFF BY CATEGORY

	Number Arriving*	Percentage of Travel Mode Auto	MBTA**	Walk***	
Nursing Manager	1	Too Few Responses			
Registered Nurse	19	80	20	0	
Ancillary Nurse	8	25	75	0	
Administrator	9	100	0	0	
Manager/Supervisor	19	76	19	5	
Research Assistant	36	43	50	7	
Research Investigator	25	27	18	55	
Secretary	20	66	19	15	
Office/Clerical Worker	48	53	47	0	
Intern/Resident/Fellow	48	25	58	17	
Staff Physician	29	90	5	5	
Clinical Technical	17	60	40	0	
Clinical Professional	6	67	22	11	
Non-Clinical Professional	15	75	25	0	
Maintenance/Repair	4	Too Few Responses			
Support Services	9	50	50	0	
Students	1	Too Few Responses			
Composite	314	55		35	10

* Number commuting to JDC on a typical weekday.
** Includes MASCO Cambridge shuttle.
*** Includes bicycle.

Table 3 **JOSLIN VEHICLE TRIP GENERATION**

	Daily		AM Peak Hour		PM Peak Hour	
	In	Out	In	Out	In	Out
Patients:						
1990	194	194	21	3	1	11
1995	258	258	28	4	1	15
Net New	64	64	7	1	0	4
Workers:						
1990	166	166	82	0	0	87
1995	192	192	94	0	0	99
Net New	26	26	12	0	0	12
Total:						
1990	360	360	103	3	1	98
1995	450	450	122	4	1	114
Net New	90	90	19	1	0	16

Trip Distribution and Assignment

Once the volume of traffic generated by the project is known, the next step is to determine the travel routes they would follow to travel to and from their parking location. As stated earlier, the Joslin is not planning to build additional parking at or near the site to accommodate project parking needs. Instead, the JDC intends to handle the bulk of its increased staff parking needs at the MASCO Mixed Use Development (375 Longwood Avenue) using 34 monthly spaces.

It is expected that the new patients generated by the project would also park in one of the two area's public parking facilities, most notably the 375 Longwood Avenue development and the Deaconess Garage. A total of 110 turnover spaces will be available at 375 Longwood. Should it be necessary to free up more patient parking in the Deaconess Garage, both the New England Deaconess Hospital and the Joslin will assign new employees to other off-site locations.

As a next step, the project-generated vehicle trips in the morning and evening peak hours were assigned to the area roadway system based on information presented in the Longwood Medical Area Transportation Study. The vehicle-trip distributions are presented in Table 4. Work trips and non-work trips were distributed separately because the geographic distribution of LMA workers is different from that of patients and visitors. It was assumed that all physician and employee trips in the peak hours are work related, and all patient trips are non-work related.

Table 4 **DISTRIBUTION OF WORK AND NON-WORK TRIPS**

	Work		Non-Work	
	Morning	Evening	Morning	Evening
Jamaicaway	24%	22%	26%	13%
Route 9 West	21%	24%	16%	21%
Longwood Avenue and Park Drive West	24%	19%	15%	23%
Kenmore Square, Storrow Drive and Massachusetts Turnpike	22%	19%	36%	34%
All Others	9%	16%	7%	9%
TOTAL	100%	100%	100%	100%

Background Traffic Growth

To assess traffic conditions in 1993, the completion date for the project, it is necessary not only to forecast project-related traffic increases, but also to predict increases in background traffic. Growth in background traffic is a function of other development activity expected within the area. This growth can be projected by the application of a generalized growth factor or by the assessment of specific development proposals. For this analysis, the projection of background or No-Build traffic (i.e., future traffic without the Research and Clinic Facility development) was based mainly on the LMA Transportation Study conducted for MASCO.[3] The LMA traffic growth forecast from 1987 to 1992 was used as background traffic. In addition, estimated traffic from the proposed Olmsted Plaza project,[4] the proposed Southeast Building at Beth Israel Hospital[5] and the proposed Clinical Support Facility at Brigham and Women's Hospital was included for background traffic as these projects were not included in the LMA transportation study growth forecasts. It should be noted here that the project-generated traffic assigned to the 375 Longwood Avenue Garage has been double counted as this traffic is also a part of the growth forecast for 1992 LMA traffic.

3/ Longwood Medical Area Transportation Study, Technical Memorandum #2, Five-Year Growth Horizon; Vanasse Hangen Brustlin, Inc. (April 1988).

4/ DPIR/DEIR Olmsted Plaza; EOEA #7643; HMM Associates, Inc. (September 1989).

5/ Beth Israel Hospital Transportation Master Plan; EOEA #7406; Vanasse Hangen Brustlin, Inc. (September 1989).

Future Traffic Volumes

Peak hour traffic volumes were forecast for the analysis year (1993) under No-Build and Build conditions. The No-Build volumes which include growth forecasts from the LMA Transportation Study, the Olmsted Plaza project traffic, the Southeast Building and the CSF project traffic were added to the existing traffic volumes. The Build volumes were calculated by adding project-generated trips to the No-Build volumes. The results are presented in Figures 5 and 6.

Intersection Level of Service Analysis

Analysis Procedures

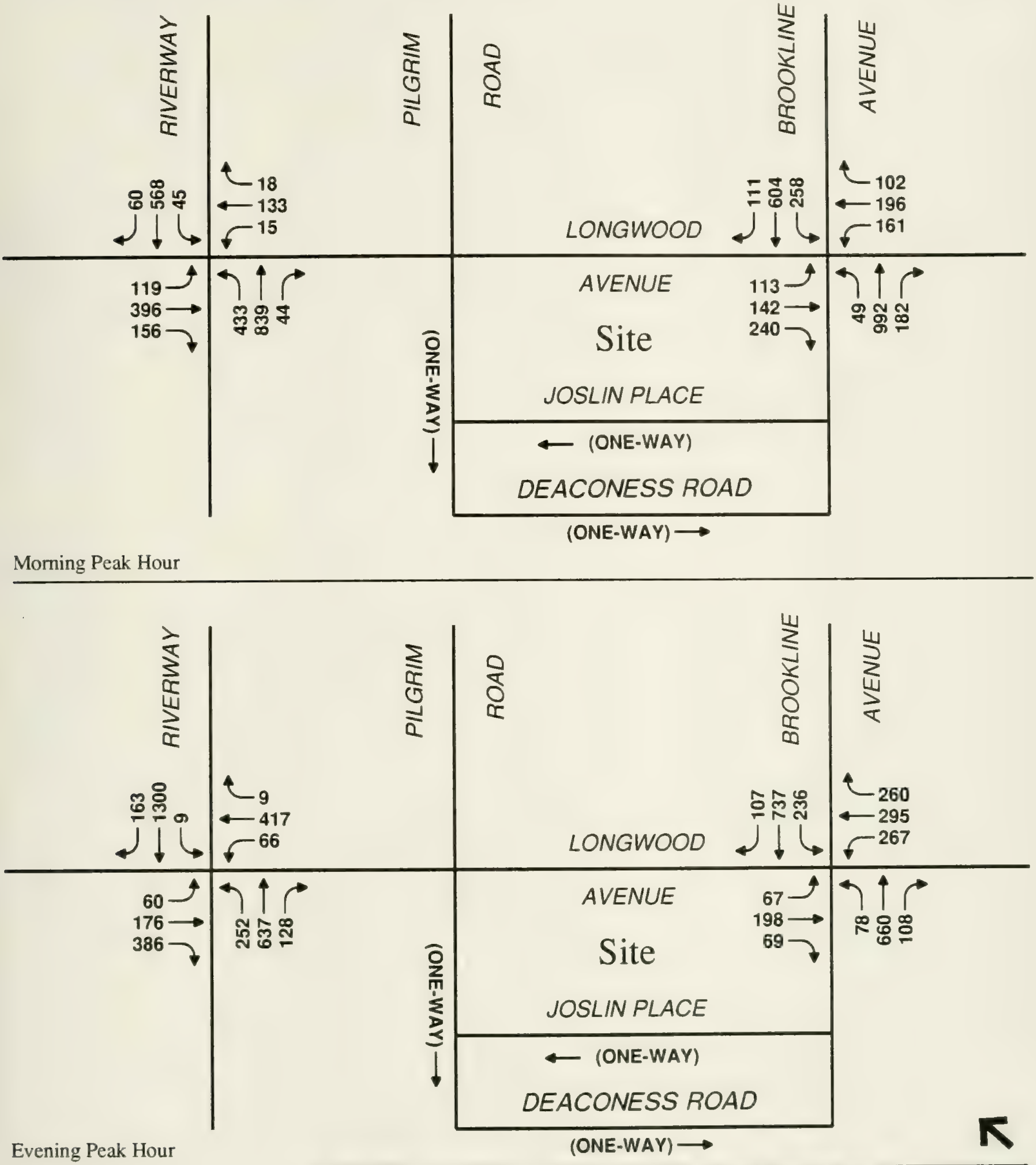
Signalized intersections were evaluated using computer programs based on procedures in the 1985 Highway Capacity Manual.[6] Signalized intersection analysis must consider a wide variety of prevailing conditions, including the amount and distribution of traffic movements, traffic composition, geometric characteristics, and the details of intersection signalization. Critical to the evaluation of signalized intersections are the concepts of capacity and level of service (LOS).

In this approach, capacity at intersections is defined for lane groups. A lane group, which may be a single movement, a group of movements, or an entire approach, is defined by the geometry of the intersection and the distribution of movements over the various lanes. Capacity (C) of a lane group is calculated as the maximum rate of flow which may pass through the intersection under prevailing traffic, roadway, and signalization conditions. The rate of flow (V) is generally measured or projected for a peak 15-minute period, and capacity is stated in vehicles per hour. Capacity analysis of intersections involves the computation of volume-to-capacity (v/c) ratios for each lane group, from which an overall intersection v/c ratio may be derived.

Generally, when two or more opposing flows are moving during a signal phase, one of the lane groups will require more green time than the other(s) in order to process all of its volume. This lane group would be defined as the critical lane group for the signal phase. The concept of a critical v/c ratio is used to evaluate the intersection as a whole, considering only the critical lane groups, i.e., those groups that have the greatest demand for green time within each signal phase. This procedure assumes that green time has been appropriately allocated. Thus, it is possible to have an overall intersection v/c of less than 1.00 (under-capacity), but still have individual movements be oversaturated within the signal cycle if the green time has not been appropriately allocated to the various approaches.

The other major concept in signalized intersection analysis is level of service, which is defined in terms of delay. Delay represents a measure of driver discomfort, frustration, fuel consumption, and lost time. Specifically, level-of-service delay criteria are stated in average stopped delay (in seconds) per vehicle for a peak 15-minute analysis period. The criteria are presented in Table 5.

6/ Highway Capacity Manual, Special Report 209; Transportation Research Board, Washington, DC (1985).



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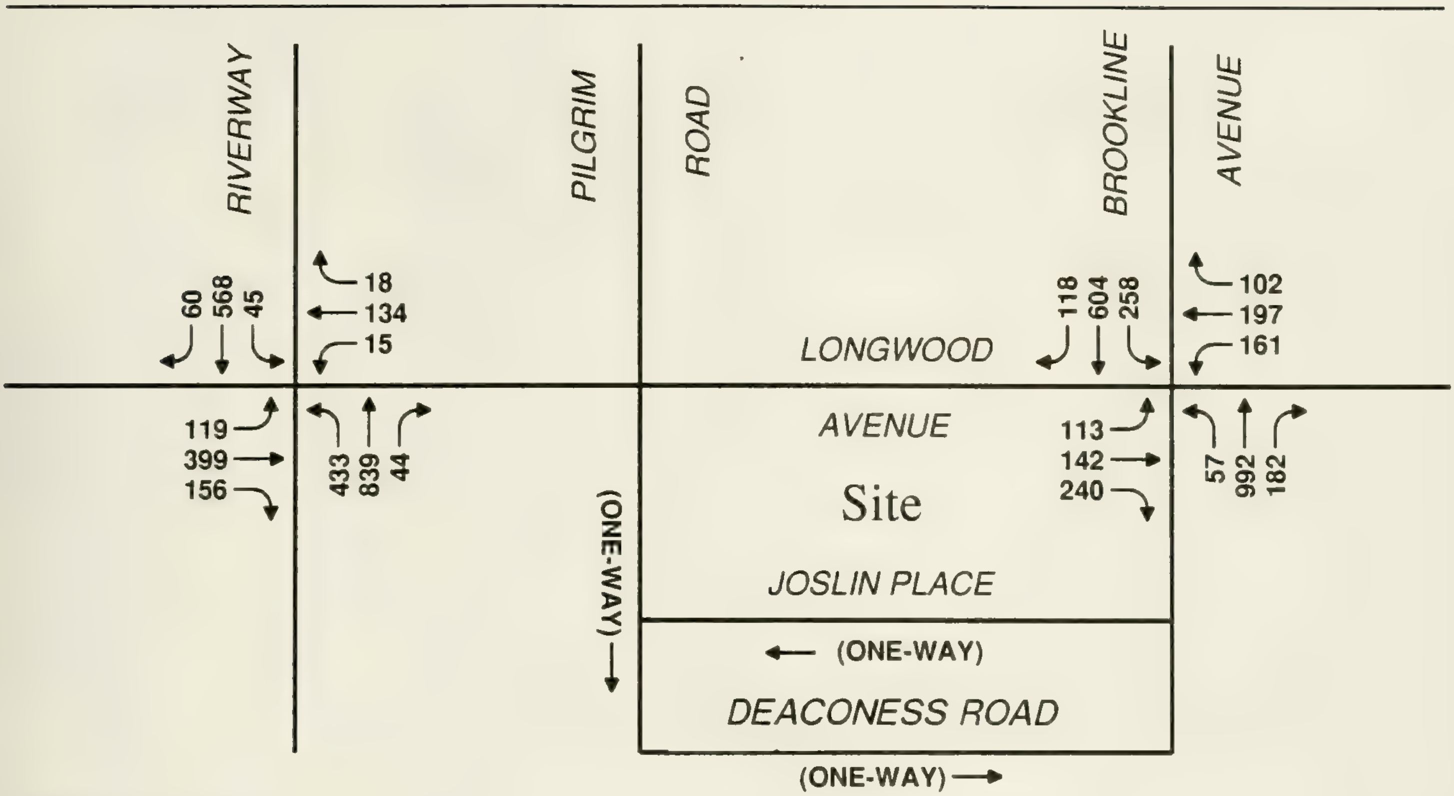
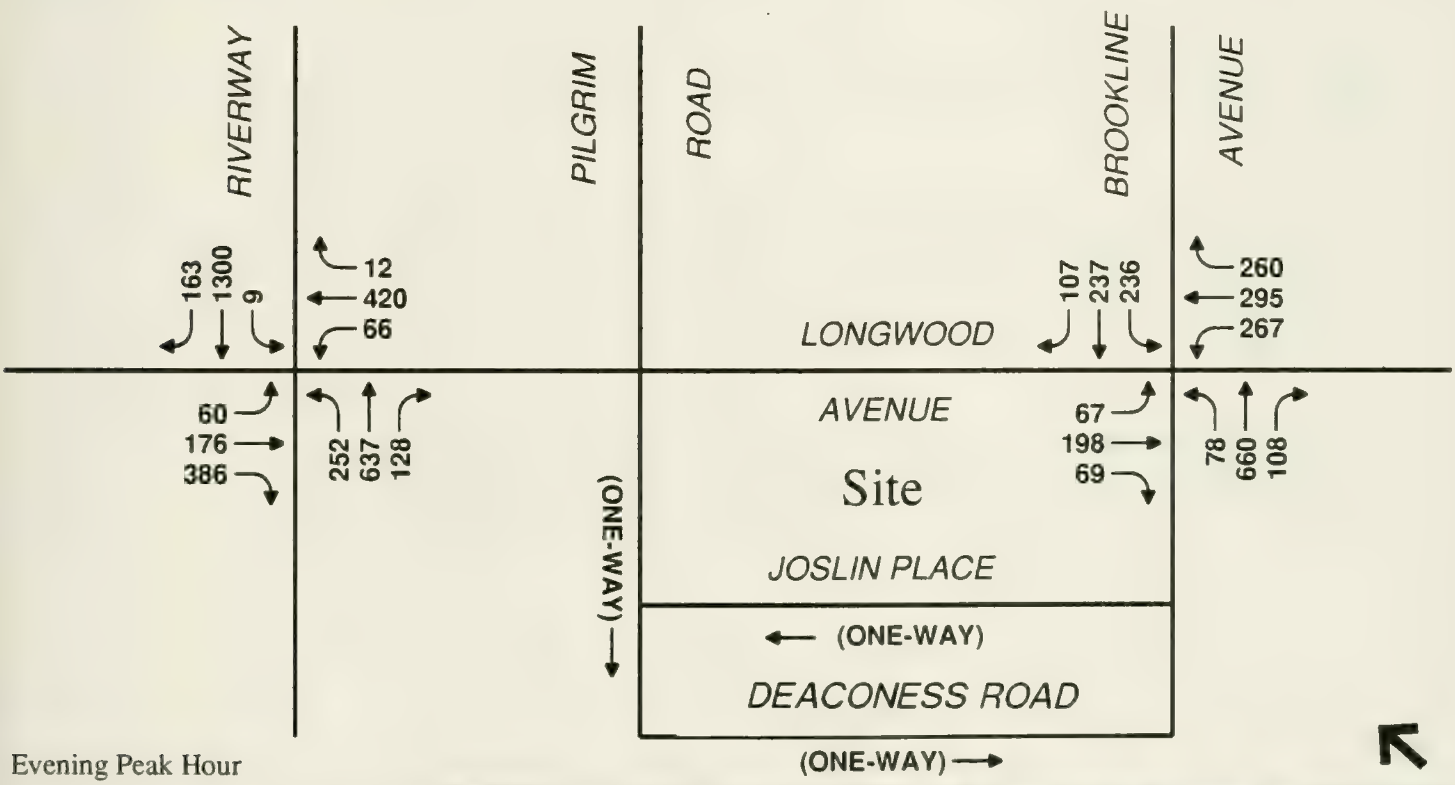
No-Build
Traffic Volumes

Figure 5



Morning Peak Hour



Evening Peak Hour

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Build
Traffic Volumes

Figure 6

Table 5 LEVEL-OF-SERVICE DELAY CRITERIA FOR SIGNALIZED INTERSECTIONS

Level of Service	Stopped Delay Per Vehicle (seconds)
A	$\leq$5.0
B	5.1 to 15.0
C	15.1 to 25.0
D	25.1 to 40.0
E	40.1 to 60.0
F	>60.0

Source: Special Report 209, Highway Capacity Manual; Transportation Research Board; Washington, DC (1985).

Delay is a complex measure which depends upon a number of variables, listed in decreasing order of importance: the quality of signal progression, the cycle length, the allocation of green times, and v/c ratios. Of note is that v/c ratios, of all the factors cited, have the least effect on delay. Thus, for any given v/c ratio, a range of delay values (and, therefore, level of service) may result. Conversely, for a given level of service, the v/c ratio may lie anywhere within a broad range.

For the reasons stated above, both capacity and level of service must be carefully examined when analyzing a signalized intersection. The designation of an approach as operating at LOS F does not automatically imply that the entire intersection, approach, or lane group is overloaded, nor does a level of service in the A to E range automatically indicate that there is unused capacity available. Together these two parameters (capacity and delay) are used to evaluate signalized intersection performance.

The two study intersections were analyzed using the procedures previously described, under existing, No-Build and Build conditions in both the morning and evening peak hours. The results of these analyses are listed in Table 6.

Table 6 INTERSECTION ANALYSIS RESULTS

	Existing			1993 No-Build			1993 Build		
	Delay**	LOS***	Total Entering Vehicles	Delay	LOS	Total Entering Vehicles	Delay	LOS	Total Entering Vehicles
Morning Peak Hour:									
Brookline Avenue and Longwood Avenue	20	C	2,533	110	F+	3,150	110	F+	3,166
Longwood Avenue and Riverway	58	E	2,043	110	F	2,826	110	F	2,830
Evening Peak Hour:									
Brookline Avenue and Longwood Avenue	33	D	2,649	33	D	3,080	33	D	3,080
Longwood Avenue and Riverway	31	D	3,156	66	F	3,543	73	F	3,549

* Average stopped delay per vehicle in seconds.
** Level of service.
*** Volume-to-capacity ratio (for signalized intersections).
+ If the proposed widening of Longwood Avenue westbound by Beth Israel Hospital is completed, operations at this location are expected to improve to LOS E.

Existing Conditions

The analysis results presented in Table 6 indicate that the intersection of Brookline Avenue and Longwood Avenue operates acceptably at LOS C in the morning peak hour and at LOS D during the evening peak hour and the intersection of Brookline Avenue and the Riverway operates at LOS E in the morning peak hour and the longest delays are for eastbound and northbound left turns. This intersection operates acceptably at LOS D in the evening peak hour.

No-Build Conditions

The addition of background development traffic forecast for 1993 is anticipated to increase intersection delay and reduce level of service for the two locations studied with the exception of Brookline and Longwood Avenues during the evening peak hour. Most of the increases in delay are expected to occur in north-south traffic movements on both the Riverway and on Brookline Avenue.

Build Conditions

There is no change in level of service expected from No-Build to Build conditions, as indicated in the table. Virtually no noticeable impact is expected to occur from project-generated traffic at either of the study intersections during either peak hour.

The deficient levels of service forecast for both intersections under both No-Build and Build conditions can be mitigated. At the Brookline and Longwood Avenue intersection, the widening of Longwood Avenue to provide a right-turn lane between Binney Street westbound to Brookline Avenue--proposed as part of the Beth Israel Hospital Clinical Center development--will improve operating conditions. At the Longwood/Riverway intersection, studies by MASCO are ongoing regarding the realignment of pedestrian crossings, rephasing of the signal, and coordination with traffic signals in the town of Brookline, which will all help to improve future level of service.

In order to help mitigate what are admittedly difficult traffic conditions in the area, JDC has not proposed to construct any new parking to support the project. The benefit of this policy is that it will minimize the number of new trips on area streets.

Site Design Analysis

The project represents a vertical expansion and will have little or virtually no effect on the access configuration or on-site parking or loading conditions. Patient pickup and drop-off activity will continue at the site's main entrance along Joslin Place, utilizing a curbside loading zone designated for this purpose. For this project, the existing traffic circulation system around the site is expected to remain the same when the project is completed, and it appears that the area's streets will be able to handle the moderate increase in pickup and drop-off activity that is anticipated without adverse effects on the abutting roadways.

Loading

On-site loading for project related deliveries will occur at the existing off-street loading dock which is accessed from the Service Yard on Longwood Avenue. All JDC deliveries are now directed to this loading dock. Following the recent restriping project on Brookline Avenue, the Boston Transportation Department (BTD) restored curbside delivery activities on Brookline Avenue in front of the site during the hours of 7:00 PM to 11:00 AM to accommodate deliveries for JDC's retail tenants. Because no new retail stores will be constructed, no increase in retail truck deliveries is expected.

PARKING IMPACTS

Joslin Diabetes Center treats patients Monday through Friday from 8:00 AM until 5:00 PM, with appointments scheduled fairly evenly during that nine-hour period. The patient survey showed that 74 percent of all patients traveling by automobile park for less than two hours. Only 10 percent park for more than three hours.

Based on the survey data, Joslin creates a demand for 39 patient parking spaces in the average hour on a typical weekday, and planned growth in clinical activity is expected to create a demand for an additional 13 patient parking spaces in the average hour on a typical weekday by 1995. The peak parking demand for patients may be slightly greater than the average, both today and in the future. Specifically, the increase in peak parking demand may be 14 to 16 spaces instead of just 13. However, peak requirements are less important at Joslin than they would be at an isolated clinic with its own dedicated parking facility. Joslin makes only a small contribution to the areawide parking demand, which is affected by several large institutions with variable parking demands. An unusually busy hour or day at Joslin would not have a significant effect on area parking garages. It appears that the additional demand for patient parking will be served by some of the 110 public spaces in the proposed MASCO development across Longwood Avenue or by the nearby Deaconess Garage. The 110 turnover spaces have not been committed to meet the patient parking needs of other institutions in the area. It should be noted that if existing patterns continue, Joslin's peak on-street parking demand could increase from approximately ten (10) to 13 on-street parkers at the peak time of day.

Existing staff parking demand is approximately 166 spaces, based on the survey data. (Only 149 monthly parking stickers are requested and issued, but some staff members, especially those who do not drive every day, may prefer to pay daily rather than monthly.) If current commuting patterns continue, staff parking demand is projected to increase by 26 spaces by 1995. The Joslin may be able to actually require fewer spaces because of the CommuteWorks program and because no new on-site parking is planned. MASCO has allocated 34 monthly spaces in its proposed 750-space garage for use by Joslin staff members. Thus, it appears that the increase in staff parking demand can be accommodated off site.

As a final parking related measures, Joslin is introducing a daily voucher program to allow staff with parking privileges to use alternate transportation without losing the right to park on site. Through participation in the MBTA pass program or through ride sharing, staff have a financial incentive not to drive to the Longwood Medical Area. When designated staff do need to drive, they can purchase a voucher for on-site parking. This new and unique program has important potential to produce a net reduction in vehicle trips.

PUBLIC TRANSPORTATION IMPACTS

The project is expected to generate approximately 44 new transit trips daily, including about 15 in the morning peak hour and about 15 in the evening peak hour. These net new riders are not expected to have a significant effect on the public transportation routes serving the site.

CONSTRUCTION IMPACTS

It is anticipated that short-term construction impacts from the project will be minimal. The project is principally a rooftop addition which will substantially reduce the volume of bulk trucking normally associated with excavation, backfill and heavy concrete foundations. The primary staging and storage area for the project will be the existing JDC parking lot on Longwood Avenue. It is anticipated that construction trailers and a staging area will be located at this

point. It is expected that the need for construction deliveries to Brookline Avenue or Joslin Place will be limited; however, it will be necessary to have some short-term access from Brookline Avenue to remove the existing roof, erect steel and place concrete. The details of this need will be addressed specifically in the Construction Management Plan to be prepared by the contractor.

Measures to protect pedestrians on the adjacent sidewalks will be undertaken throughout the construction phase. Covered and passable pedestrian barricades will be provided as needed along both Brookline Avenue and Joslin Place and pedestrians will be able to use the existing area sidewalks. The patient drop-off area on Joslin Place will be maintained and continued access will be provided to the street level retail stores throughout construction.

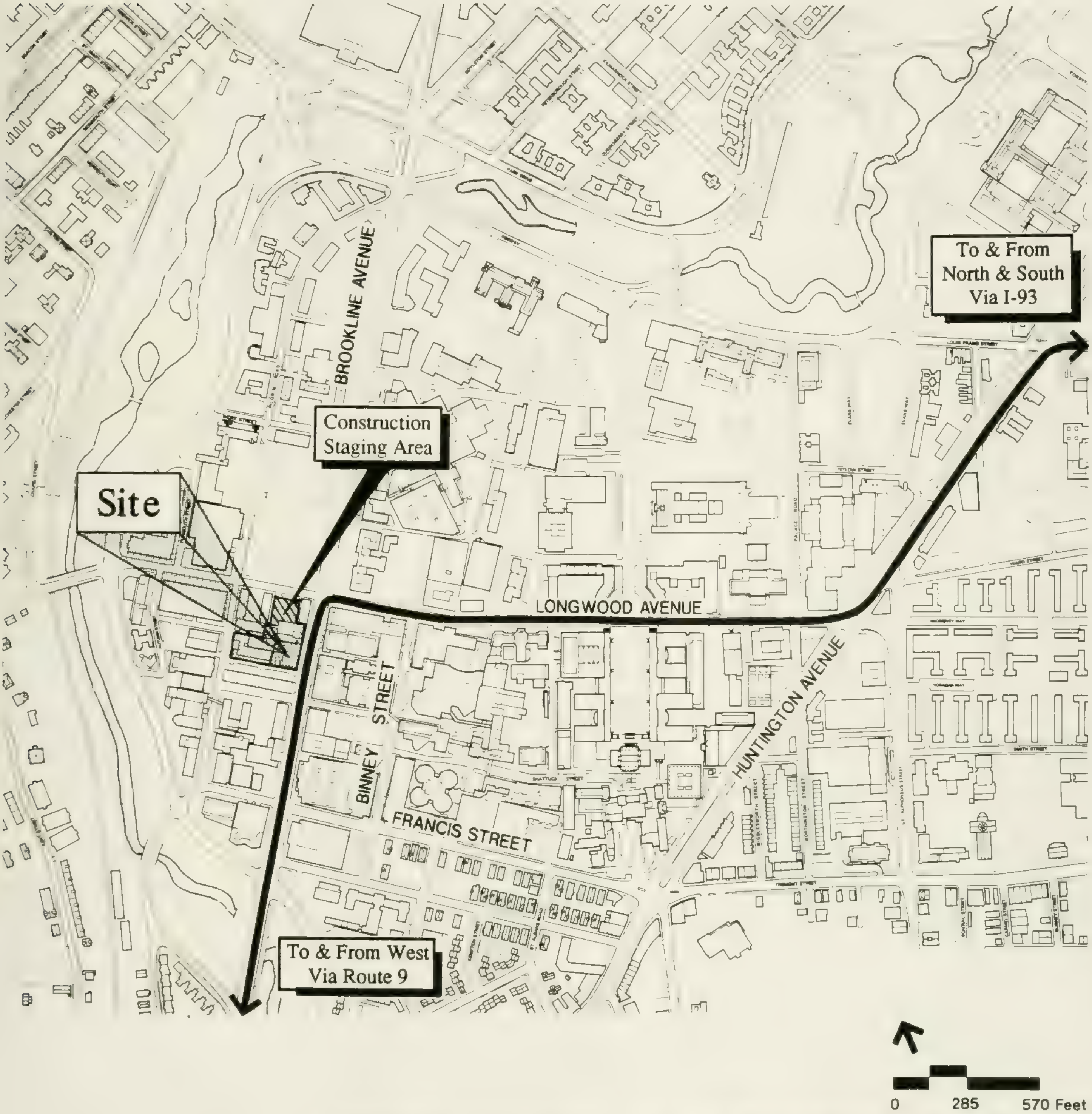
Construction Worker Parking

The construction work will require approximately two and a half years, with an anticipated normal eight-hour work shift. The number of workers required during the construction period will vary, with an estimated average daily work force of 52 workers during the construction period. The number of workers are expected to range from a low of 15 to a maximum of 100 workers on-site per day. Construction workers will be encouraged to use the available public transportation services and the JDC intends to subsidize the cost of transit passes for workers. Depending on the intensity of utilization of public transportation, it is estimated that average parking demands would be in the range of 21-35 spaces.

Because the construction workers usually arrive and depart before the commuter peak hours, the construction traffic is not expected to have a significant impact on the peak hour traffic. Parking for the construction worker vehicles will not be available on site but will be made available through MASCO at an off-site location. The workers will be shuttled to the site by bus. To encourage the promotion of work opportunities to members from adjacent neighborhoods, particularly Mission Hill, the General Conditions will also specify that the Contractor shall visit the Business Agent of each trade union involved. The obvious transportation benefit of the successful implementation of this approach is a further reduction in travel to the site. The Joslin also intends to encourage construction workers to participate in MASCO's rideshare program in an effort to mitigate traffic and parking impacts. Other measures to discourage the use of automobiles by construction workers are presented in the Mitigation section of this report.

Construction Vehicle Routings and Volumes

A comprehensive plan to handle trucking activity from any travel direction has been developed to meet the expected needs of the project.. Trucks from the north, northeast, and southeast are expected to exit I-93 at Massachusetts Avenue, arriving at the site via Ruggles Street to Huntington Avenue to Longwood Avenue and departing via the same route. Trucks to and from the southwest, west, and northwest are expected to exit I-95/128 at Route 9, arriving at the site via Brookline Avenue to Longwood Avenue and departing via the same route. The proposed truck routes as shown in Figure 7 have been developed to avoid creating impacts on residential streets.



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Proposed Construction
Vehicle Routes

Figure 7

The number of construction trucks during the construction period vary. On average, over the course of the project, it is estimated that the construction would generate seven (7) trucks per day. Assuming an even distribution over an 8-hour day, this translates to approximately one arrival and one departure per hour. The traffic impacts of these trips is expected to be negligible. On certain peak days, when concrete is being poured or particularly heavy work is underway, it is projected that the project would generate up to twenty (20) truck per day.

During construction the existing on-site parkers will be temporarily shifted to the nearby MASCO Mixed Used Development at 375 Longwood Avenue.

Mitigation and Monitoring

INTRODUCTION

The JDC has prepared and already begun to implement a comprehensive program aimed at minimizing potential impacts and reducing the number of vehicles traveling to the site. In particular, it should be noted that the Joslin has recently opened a satellite facility on Route 9 in Framingham to make care accessible for patients without traveling into Boston. The JDC has also become a member of the newly created Longwood Medical Area Transportation Management Organization (TMO) operated by the Medical Area Service Corporation (MASCO). The TMO was established to provide a coordinated areawide program of traffic and parking demand reduction.

The recommended management and mitigation plan presented in this final section of the report consists of travel demand management strategies, traffic operations improvements, and other recommendations to support the programmed growth of the Joslin Diabetes Center.

DEMAND MANAGEMENT

To address the project's parking needs, the JDC does not plan to build additional parking supply. Instead, it has developed a plan to meet its needs off site. The first is to obtain 34 additional off-site parking spaces at MASCO's soon-to-be-completed 375 Longwood Avenue Mixed Use project. Patient parking is expected to be accommodated either in the 110 turnover spaces in this facility or in the Deaconess Garage. Secondly, the JDC will continue its aggressive program aimed at reducing the number of vehicles used for commuting to the site. This demand reduction program combines disincentives for driving alone, incentives and assistance for commuting by alternative modes, and publicity to make JDC staff aware of the alternative modes and the incentives provided. The JDC is committed to this program and has already begun to implement it.

To implement many of the programs, an employee transportation coordinator has been designated and is committed to implementing a comprehensive mitigation program.

Parking Fees

Numerous studies have shown that parking fees are the most important factor in a commuter's decision whether or not to drive to work. Consistent with the recommendations of the Longwood Medical Area Transportation Study, the JDC currently prices its parking to charge the highest rates at the most conveniently located facilities. People parking off site in remote facilities pay significantly less than nearby parkers. JDC currently has a policy of not subsidizing parking costs.

On April 1, 1991, the JDC increased its monthly employee parking fees from $80 to $90 on-site and from $60 to $66 off-site. The off-site rates are approximately one-third less expensive than the on-site rates. This rate structure is an attempt to discourage people from driving alone to the site.

As a further incentive, Joslin recently introduced a daily voucher program to allow staff with parking privileges to use alternate transportation without losing the right to park on site.

Transit Subsidies for Employees

Transit subsidies, especially when combined with increased parking prices, can have a direct effect on mode choice. Employee transit subsidies are becoming increasingly prevalent. All of the major hospitals in the Longwood Medical Area (Children's Hospital, Beth Israel Hospital, the Brigham & Women's Hospital and the New England Deaconess Hospital) subsidize employee transit passes, and the Boston Transportation Department all but requires employee transit subsidies for new developments.

While parking price increases alone can control parking demand and meet transportation system objectives, total reliance on employee parking price increases may be misinterpreted as an underhanded pay cut. Because the transit pass subsidy is an employee fringe benefit, its inclusion in the plan makes clear that transportation management, not benefit reduction, is the objective.

The JDC now sells MBTA passes through payroll deduction at a 25-percent discount to its employees, up to a maximum of $15.00. Even employees who do not purchase their passes through payroll deduction are reimbursed for 25 percent of the pass cost. The JDC is committed to this measure and will continue this practice.

Areawide Ridesharing Coordination

As part of the Longwood Medical Area Transportation Management Organization, CommuteWorks, the Medical Area Service Corporation (MASCO), operates a centralized ridesharing matching service with the assistance of the state-funded Caravan for Commuters, Inc. The JDC supports these efforts through membership fees and assessments. Rideshare matching for the LMA will continue to be handled centrally by MASCO because the larger database of commuters increases the chances of successful carpools and vanpools. The JDC will continue to devote the necessary resources to support ridesharing coordination.

Promotion of Alternatives to Driving Alone

The hospital will promote ridesharing and transit usage through articles in its newsletters and through a brochure rack which has been placed in the Employee Lounge. The JDC will also provide CommuteWorks brochures and other information to new employees. Also included is a registration card for the MASCO RideSource Program.

Additionally, last spring the Joslin installed a bike track in the courtyard for its patients and employees.

Alternative Work Schedules

Alternative work schedules can reduce traffic congestion by spreading a given number of daily vehicle trips more evenly and reducing peak-hour volumes. In some cases, even total daily traffic volume can be reduced through programs that allow a given number of hours to be worked on longer shifts on fewer days. By allowing workers to adjust their commuting schedules, flexible work hours sometimes facilitate carpool formation.

To the extent possible within the business hours of the center, the Joslin utilizes alternative work schedules. Outpatient Clinic hours are 8:00 AM to 5:00 PM, and starting times for employees vary between 7:30 and 9:00 AM. Physicians hours often start before or end after the morning and afternoon peaks, respectively. Researchers often set their own which tend to be quite long.

TRAFFIC OPERATIONS IMPROVEMENTS

Through its support of MASCO, the JDC has co-sponsored an extensive study of traffic operations and transportation conditions in the Longwood Medical Area. That study recommended numerous improvements to the area's transportation system, several of which have now been implemented. Through MASCO, Joslin participated in the funding of the design and implementation of traffic improvements on Brookline and Longwood Avenues. These involved removing parking meters and restriping the pavement, resulting in two through lanes in each direction and exclusive left-turn lanes at key intersections on Brookline Avenue.

The JDC continues to participate in and support the ongoing discussions with the BTD on traffic improvements on area streets and at nearby intersections.

PEDESTRIAN SYSTEM

The JDC and its architects have been working with the Boston Redevelopment Authority so that the project is designed with an eye toward accommodating pedestrians without compromising security needs.

CONSTRUCTION MANAGEMENT

Before commencing construction, the JDC's construction contractor will negotiate and sign a construction management agreement with the BTD. The following elements are proposed:

- Secure fencing, staging, and bracing will be provided to protect nearby pedestrian traffic; walkways will be maintained on Brookline Avenue and Joslin Place and they will be covered.

- Police officer control will be provided as needed to assure pedestrian safety.

- Staging areas for construction materials are to be located on the existing parking lot adjacent to Longwood Avenue.

- Construction worker parking will not be permitted on the site or adjacent to the construction area. Instead, construction worker parking will be provided at off-site MASCO facilities which are served by shuttle bus service.

- Each construction worker who agrees to commute to the job site via public transportation for a full calendar month will be offered an MBTA pass for that month at a discount.

- Construction workers will be encouraged to participate in MASCO's ridesharing information program.

- Movement of construction materials and equipment to and from the job site will be staggered over the course of the workday.

- Clear designated truck routes for the movement of demolition debris and construction materials have been identified provided. These routes will avoid impacting residential streets, focusing instead on Longwood and Brookline avenues.

Finally, the Joslin will include a provision in its General Conditions that specifies that the Contractor shall visit the Business Agent of each trade union involved to encourage the promotion of work opportunities to members from adjacent neighborhoods, particularly Mission Hill.

CONCLUSION

Before commencing construction, Joslin will be required to sign a Transportation Access Plan Agreement (TAPA) specifying its commitments to mitigate any potential transportation impacts related to the facility expansion.

Joslin Diabetes Center places relatively little demand on the area transportation system, and the planned expansion during the coming five years will not have a significant impact. The Joslin Diabetes Center's objectives are to address the projected staff parking deficit by reducing parking demand and utilizing off-site parking rather than by increasing its parking supply in the project area. The JDC strongly supports MASCO's and the city of Boston's efforts to improve traffic flow in the Longwood Medical Area. The JDC is also committed to doing its part to reduce vehicle-trip generation and encourage the use of alternative transportation modes.

Appendix

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
JOSLIN: RIVERWAY/LONGWOOD
EXISTING (1989) AM PEAK HOUR
date:03-05-1991 time:15:48:05
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=RWLWEXAM GEOMETRICS=RWLWEXAM SIGNAL=RWLWEXAM
LOCATED IN CBD:n

VOLUME & GEOMETRICS

	VOLUMES			# OF LANES			LANE WIDTH			CROSS
DIR	LT	TH	RT	LT	TH	RT	LT	TH	RT	WALK
EB	107	361	154	0	1	1	0.0	11.0	10.0	34
WB	5	125	8	1	1	0	9.0	9.0	0.0	34
NB	400	702	20	1	2	0	11.0	10.0	0.0	59
SB	45	564	60	0	2	1	0.0	10.5	10.0	59

TRAFFIC & ROADWAY CONDITIONS

			ADJ	PARK			PEDESTRIANS			ARR
DIR	GRADE	%HV	Y/N	MOVES	BUSES	PHF	CROSS	BUT	MIN TIME	TYPE
EB	0.0%	1.2%	N	0	0	.880	20	y	15.5	3
WB	-2.0%	8.7%	N	0	0	.880	20	y	15.5	3
NB	0.0%	0.3%	N	0	0	.880	35	y	21.8	3
SB	0.0%	0.3%	N	0	0	.880	35	Y	21.8	3

PHASINGS

	EASTBOUND				WESTBOUND				NORTHBOUND				SOUTHBOUND				GREEN	Y+R	PRE/ACT
	l	t	r	p	l	t	r	p	l	t	r	p	l	t	r	p			
1	*	*	*		*	*	*										43.0	5	P
2				*				*				*				*	0.0	22	P
3			*						*	*	*						28.0	0	P
4									*	*	*		*	*	*		57.0	5	P

CYCLE= 160.0

VOLUME ADJUSTMENT WORKSHEET

PART 1 (MOVEMENT ADJUSTMENTS)

DIR	LTV	THV	RTV	PHF	LTFR	THFR	RTFR
EB	107	361	154	.880	122	410	175
WB	5	125	8	.880	6	142	9
NB	400	702	20	.880	455	798	23
SB	45	564	60	.880	51	641	68

PART 2 (LANE GROUP ADJUSTMENTS)

DIR	LN GROUP	FLOW	N	LU	v	Plt	Prt
EB	LT-TH	532	1	1.00	532	0.23	0.00
EB	RT	175	1	1.00	175	0.00	1.00
WB	LT	6	1	1.00	6	1.00	0.00
WB	TH-RT	151	1	1.00	151	0.00	0.06
NB	LT	455	1	1.00	455	1.00	0.00
NB	TH-RT	820	2	1.05	861	0.00	0.03
SB	LT-TH	692	2	1.05	727	0.07	0.00
SB	RT	68	1	1.00	68	0.00	1.00

PART 3 (OPPOSING VOLUME ADJUSTMENTS)

LEFT TURN	OPPOSING APPROACH									
BEING OPPOSED	VOLUMES			% OPPOSING LEFT TURN			# LANES			OPPOSING
	LT	TH	RT	LT	TH	RT	LT	TH	RT	VOLUME
EASTBOUND	6	142	9	100	100	100	1	1	0	151
WESTBOUND	122	410	175	100	100	0	0	1	1	410
NORTHBOUND	51	641	68	100	100	0	0	2	1	692
SOUTHBOUND	455	798	23	0	67	67	1	2	0	550

SATURATION FLOW ADJUSTMENT WORKSHEET

DIR	LN GROUP	IDEAL	N	Fwid	Fhv	Fgr	Fpark	Fbus	Farea	Frt	Flt	s
EB	LT-TH	1950	1	0.967	0.994	1.000	1.000	1.000	1.000	1.000	0.857	1606
EB	RT	1950	1	0.933	0.994	1.000	1.000	1.000	1.000	0.850	1.000	1538
WB	LT	1950	1	0.900	0.958	1.010	1.000	1.000	1.000	1.000	0.142	241
WB	TH-RT	1950	1	0.900	0.958	1.010	1.000	1.000	1.000	0.991	1.000	1683
NB	LT	1950	1	0.967	0.999	1.000	1.000	1.000	1.000	1.000	0.950	1788
NB	TH-RT	1950	2	0.933	0.999	1.000	1.000	1.000	1.000	0.996	1.000	3619
SB	LT-TH	1950	2	0.950	0.999	1.000	1.000	1.000	1.000	1.000	0.837	3098
SB	RT	1950	1	0.933	0.999	1.000	1.000	1.000	1.000	0.850	1.000	1545

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT

INPUT VARIABLES

DIR	C	G	N	Va	Vm	Vlt	Plt	No	Vo	Plto
EB	160	43	1	532	585	122	0.23	1	151	0.00
WB	160	43	1	6	151	6	1.00	1	410	0.23
SB	160	57	2	692	760	51	0.07	2	550	0.00

CALCULATIONS

DIR	Soo	Yo	Gu	Fs	Pl	Go	Pt	Gf	El	Fm	Flt
EB	1800	0.084	32.276	0.781	0.229	10.724	0.771	5.070	1.441	0.857	0.857
WB	1635	0.251	3.813	0.619	1.000	39.187	0.000	0.000	1.819	0.142	0.142
SB	3600	0.153	38.419	0.531	0.243	18.581	0.757	5.761	2.118	0.675	0.837

CAPACITY ANALYSIS WORKSHEET

DIR	LN GROUP	v	s	v/s	g/C	c	v/c	CRITICAL
EB	LT-TH	532	1606	0.33	0.27	431	1.23	*
EB	RT	175	1538	0.11	0.44	682	0.26	
WB	LT	6	241	0.02	0.27	65	0.09	
WB	TH-RT	151	1683	0.09	0.27	452	0.33	
NB	LT	455	1788	0.16	0.18	488	0.93	*
NB	TH-RT	861	3619	0.24	0.53	1923	0.45	
SB	LT-TH	727	3098	0.23	0.36	1104	0.66	*
SB	RT	68	1545	0.04	0.36	550	0.12	

CYCLE=160.0 LOST=32.0 SUM V/S CRIT= 0.73 TOTAL V/C= 0.91

FOR THE NORTHBOUND PROTECTED/PERMISSIVE LEFT TURN LANE THE CAPACITY. V/S AND V/C RATIOS HAVE ALL BEEN ADJUSTED TO REFLECT A CAPACITY FOR 47 LEFT TURNS ON THE CHANGE INTERVAL AND 128 ON THE PERMISSIVE PHASE

LEVEL OF SERVICE WORKSHEET

DIR	LN GROUP	v/c	g/C	C	d1	c	d2	PF	Delay	LOS	Avg Q	95% Q
EB	LT-TH	1.23	0.27	160.0	48.61	431	144.11	1.00	192.72	F	37.1	
EB	RT	0.26	0.44	160.0	21.23	682	0.05	1.00	21.27	C	4.3	
WB	LT	0.09	0.27	160.0	33.30	65	0.02	1.00	33.31	D	0.2	
WB	TH-RT	0.33	0.27	160.0	35.72	452	0.17	1.00	35.89	D	4.9	
NB	LT	0.93	0.53	160.0	26.47	488	18.01	1.00	44.48	E	16.7	
NB	TH-RT	0.45	0.53	160.0	17.53	1923	0.12	1.00	17.65	C	17.1	
SB	LT-TH	0.66	0.36	160.0	32.92	1104	1.03	1.00	33.95	D	19.8	
SB	RT	0.12	0.36	160.0	26.36	550	0.01	1.00	26.37	D	2.0	

DIR	Delay	LOS
EB	150.27	F
WB	35.80	D
NB	26.92	D
SB	33.30	D

INTERSECTION DELAY = 58.40 INTERSECTION LOS=E

THE CYCLE LENGTH WITHIN THE BOUNDS OF 100 TO 100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE 137.5 SECONDS
for chosen cycle length 100.0
suggested timing phase 1 is 30.9 secs green. 5.0 secs yellow + red clear
suggested timing phase 2 is 0.0 secs green. 22.0 secs yellow + red clear
suggested timing phase 3 is 15.2 secs green. 0.0 secs yellow + red clear
suggested timing phase 4 is 21.9 secs green. 5.0 secs yellow + red clear

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
JOSLIN: RIVERWAY/LONGWOOD
NO-BUILD 1993 AM PEAK HOUR
date:03-05-1991 time:15:51:24
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=RWLWNBAM GEOMETRICS=RWLWNBAM SIGNAL=RWLWNBAM
LOCATED IN CBD:n

VOLUME & GEOMETRICS

	VOLUMES			# OF LANES			LANE WIDTH			CROSS
DIR	LT	TH	RT	LT	TH	RT	LT	TH	RT	WALK
EB	119	396	156	0	1	1	0.0	11.0	10.0	34
WB	15	133	18	1	1	0	9.0	9.0	0.0	34
NB	433	839	44	1	2	0	11.0	10.0	0.0	59
SB	45	568	60	0	2	1	0.0	10.5	10.0	59

TRAFFIC & ROADWAY CONDITIONS

			ADJ	PARK			PEDESTRIANS			ARR
DIR	GRADE	%HV	Y/N	MOVES	BUSES	PHF	CROSS	BUT	MIN TIME	TYPE
EB	0.0%	1.2%	N	0	0	.880	20	y	15.5	3
WB	-2.0%	8.7%	N	0	0	.880	20	y	15.5	3
NB	0.0%	0.3%	N	0	0	.880	35	y	21.8	3
SB	0.0%	0.3%	N	0	0	.880	35	Y	21.8	3

PHASINGS

	EASTBOUND				WESTBOUND				NORTHBOUND				SOUTHBOUND				GREEN	Y+R	PRE/ACT
	l	t	r	p	l	t	r	p	l	t	r	p	l	t	r	p			
1	*	*	*		*	*	*										31.4	5	P
2				*				*				*				*	0.0	22	P
3			*						*	*	*						15.2	0	P
4									*	*	*		*	*	*		21.3	5	P

CYCLE= 100.0

VOLUME ADJUSTMENT WORKSHEET

PART 1 (MOVEMENT ADJUSTMENTS)

DIR	LTV	THV	RTV	PHF	LTFR	THFR	RTFR
EB	119	396	156	.880	135	450	177
WB	15	133	18	.880	17	151	20
NB	433	839	44	.880	492	953	50
SB	45	568	60	.880	51	645	68

PART 2 (LANE GROUP ADJUSTMENTS)

DIR	LN GROUP	FLOW	N	LU	v	Plt	Prt
EB	LT-TH	585	1	1.00	585	0.23	0.00
EB	RT	177	1	1.00	177	0.00	1.00
WB	LT	17	1	1.00	17	1.00	0.00
WB	TH-RT	172	1	1.00	172	0.00	0.12
NB	LT	492	1	1.00	492	1.00	0.00
NB	TH-RT	1003	2	1.05	1054	0.00	0.05
SB	LT-TH	697	2	1.05	731	0.07	0.00
SB	RT	68	1	1.00	68	0.00	1.00

PART 3 (OPPOSING VOLUME ADJUSTMENTS)

LEFT TURN	OPPOSING APPROACH									
BEING OPPOSED	VOLUMES			% OPPOSING LEFT TURN			# LANES			OPPOSING
	LT	TH	RT	LT	TH	RT	LT	TH	RT	VOLUME
EASTBOUND	17	151	20	100	100	100	1	1	0	172
WESTBOUND	135	450	177	100	100	0	0	1	1	450
NORTHBOUND	51	645	68	100	100	0	0	2	1	697
SOUTHBOUND	492	953	50	0	58	58	1	2	0	585

SATURATION FLOW ADJUSTMENT WORKSHEET

DIR	LN GROUP	IDEAL	N	Fwid	Fhv	Fgr	Fpark	Fbus	Farea	Frt	Flt	s
EB	LT-TH	1950	1	0.967	0.994	1.000	1.000	1.000	1.000	1.000	0.904	1693
EB	RT	1950	1	0.933	0.994	1.000	1.000	1.000	1.000	0.850	1.000	1538
WB	LT	1950	1	0.900	0.958	1.010	1.000	1.000	1.000	1.000	0.214	364
WB	TH-RT	1950	1	0.900	0.958	1.010	1.000	1.000	1.000	0.982	1.000	1668
NB	LT	1950	1	0.967	0.999	1.000	1.000	1.000	1.000	1.000	0.950	1788
NB	TH-RT	1950	2	0.933	0.999	1.000	1.000	1.000	1.000	0.993	1.000	3607
SB	LT-TH	1950	2	0.950	0.999	1.000	1.000	1.000	1.000	1.000	0.777	2874
SB	RT	1950	1	0.933	0.999	1.000	1.000	1.000	1.000	0.850	1.000	1545

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT

INPUT VARIABLES

DIR	C	G	N	Va	Vm	Vlt	Plt	No	Vo	Plto
EB	100	31	1	585	627	135	0.23	1	172	0.00
WB	100	31	1	17	172	17	1.00	1	450	0.23
SB	100	21	2	697	765	51	0.07	2	585	0.00

CALCULATIONS

DIR	Sop	Yo	Gu	Fs	Pl	Gq	Pt	Gf	El	Fm	Flt
EB	1800	0.095	24.219	0.768	0.231	7.224	0.769	4.079	1.465	0.904	0.904
WB	1625	0.277	5.194	0.594	1.000	26.250	0.000	0.000	1.895	0.214	0.214
SB	3600	0.162	6.045	0.509	0.280	15.267	0.720	4.727	2.208	0.554	0.777

CAPACITY ANALYSIS WORKSHEET

DIR	LN GROUP	v	s	v/s	g/C	c	v/c	CRITICAL
EB	LT-TH	585	1693	0.35	0.31	532	1.10	*
EB	RT	177	1538	0.12	0.47	718	0.25	
WB	LT	17	364	0.05	0.31	115	0.15	
WB	TH-RT	172	1668	0.10	0.31	525	0.33	
NB	LT	492	1788	0.22	0.15	348	1.41	*
NB	TH-RT	1054	3607	0.29	0.37	1319	0.80	
SB	LT-TH	731	2874	0.25	0.21	613	1.19	*
SB	RT	68	1545	0.04	0.21	329	0.21	

CYCLE=100.0 LOST=32.0 SUM V/S CRIT= 0.82 TOTAL V/C= 1.20

FOR THE NORTHBOUND PROTECTED/PERMISSIVE LEFT TURN LANE THE CAPACITY. V/S AND V/C RATIOS HAVE ALL BEEN ADJUSTED TO REFLECT A CAPACITY FOR 75 LEFT TURNS ON THE CHANGE INTERVAL AND 0 ON THE PERMISSIVE PHASE

LEVEL OF SERVICE WORKSHEET

DIR	LN GROUP	v/c	g/C	C	d1	c	d2	PF	Delay	LOS	Avg Q	95% Q
EB	LT-TH	1.10	0.31	100.0	27.30	532	64.10	1.00	91.39	F	20.4	
EB	RT	0.25	0.47	100.0	12.21	718	0.04	1.00	12.25	B	2.6	
WB	LT	0.15	0.31	100.0	18.74	115	0.05	1.00	18.78	C	0.3	
WB	TH-RT	0.33	0.31	100.0	19.91	525	0.14	1.00	20.04	C	3.3	
NB	LT	1.41	0.37	100.0	31.67	348	311.84	1.00	343.51	F	52.7	
NB	TH-RT	0.80	0.37	100.0	21.61	1319	2.52	1.00	24.12	C	17.7	
SB	LT-TH	1.19	0.21	100.0	31.56	613	112.59	1.00	144.15	F	35.5	
SB	RT	0.21	0.21	100.0	24.62	329	0.05	1.00	24.66	C	1.5	

DIR	Delay	LOS
EB	72.99	F
WB	19.93	C
NB	125.80	F
SB	133.96	F

INTERSECTION DELAY =109.51 INTERSECTION LOS=F

THE CYCLE LENGTH WITHIN THE BOUNDS OF 100 TO 100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE 226.5 SECONDS
for chosen cycle length 100.0
suggested timing phase 1 is 28.8 secs green. 5.0 secs yellow + red clear
suggested timing phase 2 is 0.0 secs green. 22.0 secs yellow + red clear
suggested timing phase 3 is 18.0 secs green. 0.0 secs yellow + red clear
suggested timing phase 4 is 21.2 secs green. 5.0 secs yellow + red clear

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CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
JOSLIN: RIVERWAY/LONGWOOD
BUILD 1993 AM PEAK HOUR
date:03-05-1991            time:15:52:54
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=RWLWBAM    GEOMETRICS=RWLWNBAM   SIGNAL=RWLWNBAM
LOCATED IN CBD:n
VOLUME & GEOMETRICS
        VOLUMES      # OF LANES     LANE WIDTH     CROSS
DIR  LT   TH   RT    LT TH RT      LT   TH   RT    WALK
EB  119  399  156     0  1  1      0.0 11.0 10.0    34
WB   15  134   18     1  1  0      9.0  9.0  0.0    34
NB  433  839   44     1  2  0     11.0 10.0  0.0    59
SB   45  568   60     0  2  1      0.0 10.5 10.0    59

TRAFFIC & ROADWAY CONDITIONS
                 ADJ PARK             PEDESTRIANS        ARR
DIR GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
EB  0.0%  1.2%   N     0     0  .880   20   y    15.5    3
WB -2.0%  8.7%   N     0     0  .880   20   y    15.5    3
NB  0.0%  0.3%   N     0     0  .880   35   y    21.8    3
SB  0.0%  0.3%   N     0     0  .880   35   Y    21.8    3

PHASINGS
    EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1  #  #  #     #  #  #                             31.4   5    P
 2           #           #           #           #   0.0  22    P
 3        #                 #  #  #                 15.2   0    P
 4                          #  #  #     #  #  #     21.3   5    P

CYCLE= 100.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)
DIR  LTV  THV  RTV   PHF  LTFR THFR RTFR
EB   119  399  156  .880   135  453  177
WB    15  134   18  .880    17  152   20
NB   433  839   44  .880   492  953   50
SB    45  568   60  .880    51  645   68

PART 2 (LANE GROUP ADJUSTMENTS)
DIR LN GROUP  FLOW N   LU    v  Plt  Prt
EB  LT-TH      589 1 1.00  589 0.23 0.00
EB  RT         177 1 1.00  177 0.00 1.00
WB  LT          17 1 1.00   17 1.00 0.00
WB  TH-RT      173 1 1.00  173 0.00 0.12
NB  LT         492 1 1.00  492 1.00 0.00
NB  TH-RT     1003 2 1.05 1054 0.00 0.05
SB  LT-TH      697 2 1.05  731 0.07 0.00
SB  RT          68 1 1.00   68 0.00 1.00

PART 3 (OPPOSING VOLUME ADJUSTMENTS)
LEFT TURN                OPPOSING APPROACH
BEING OPPOSED       VOLUMES      % OPPOSING LEFT TURN    # LANES      OPPOSING
                  LT   TH   RT       LT   TH   RT       LT  TH  RT     VOLUME
EASTBOUND         17  152   20      100  100  100        1   1   0      173
WESTBOUND        135  453  177      100  100    0        0   1   1      453
NORTHBOUND        51  645   68      100  100    0        0   2   1      697
SOUTHBOUND       492  953   50        0   58   58        1   2   0      585

SATURATION FLOW ADJUSTMENT WORKSHEET
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DIR	LN GROUP	IDEAL	N	Fwid	Fhv	Fgr	Fpark	Fbus	Farea	Frt	Flt	s
EB	LT-TH	1950	1	0.967	0.994	1.000	1.000	1.000	1.000	1.000	0.903	1692
EB	RT	1950	1	0.933	0.994	1.000	1.000	1.000	1.000	0.850	1.000	1538
WB	LT	1950	1	0.900	0.958	1.010	1.000	1.000	1.000	1.000	0.210	356
WB	TH-RT	1950	1	0.900	0.958	1.010	1.000	1.000	1.000	0.982	1.000	1668
NB	LT	1950	1	0.967	0.999	1.000	1.000	1.000	1.000	1.000	0.950	1788
NB	TH-RT	1950	2	0.933	0.999	1.000	1.000	1.000	1.000	0.993	1.000	3607
SB	LT-TH	1950	2	0.950	0.999	1.000	1.000	1.000	1.000	1.000	0.777	2874
SB	RT	1950	1	0.933	0.999	1.000	1.000	1.000	1.000	0.850	1.000	1545

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT

INPUT VARIABLES

DIR	C	G	N	Va	Vm	Vlt	Plt	No	Vo	Plto
EB	100	31	1	589	631	135	0.23	1	173	0.00
WB	100	31	1	17	173	17	1.00	1	453	0.23
SB	100	21	2	697	765	51	0.07	2	585	0.00

CALCULATIONS

DIR	Sop	Yo	Gu	Fs	Pl	Go	Pt	Gf	El	Fm	Flt
EB	1800	0.096	24.167	0.767	0.230	7.277	0.770	4.112	1.467	0.903	0.903
WB	1626	0.279	4.928	0.592	1.000	26.515	0.000	0.000	1.902	0.210	0.210
SB	3600	0.162	6.045	0.509	0.280	15.267	0.720	4.727	2.208	0.554	0.777

CAPACITY ANALYSIS WORKSHEET

DIR	LN GROUP	v	s	v/s	g/C	c	v/c	CRITICAL
EB	LT-TH	589	1692	0.35	0.31	532	1.11	*
EB	RT	177	1538	0.12	0.47	718	0.25	
WB	LT	17	356	0.05	0.31	112	0.15	
WB	TH-RT	173	1668	0.10	0.31	525	0.33	
NB	LT	492	1788	0.22	0.15	348	1.41	*
NB	TH-RT	1054	3607	0.29	0.37	1319	0.80	
SB	LT-TH	731	2874	0.25	0.21	613	1.19	*
SB	RT	68	1545	0.04	0.21	329	0.21	

CYCLE=100.0 LOST=32.0 SUM V/S CRIT= 0.82 TOTAL V/C= 1.20

FOR THE NORTHBOUND PROTECTED/PERMISSIVE LEFT TURN LANE THE CAPACITY. V/S AND V/C RATIOS HAVE ALL BEEN ADJUSTED TO REFLECT A CAPACITY FOR 75 LEFT TURNS ON THE CHANGE INTERVAL AND 0 ON THE PERMISSIVE PHASE

LEVEL OF SERVICE WORKSHEET

DIR	LN GROUP	v/c	g/C	C	d1	c	d2	PF	Delay	LOS	Avg Q	95% Q
EB	LT-TH	1.11	0.31	100.0	27.39	532	67.18	1.00	94.57	F	21.1	
EB	RT	0.25	0.47	100.0	12.21	718	0.04	1.00	12.25	B	2.6	
WB	LT	0.15	0.31	100.0	18.76	112	0.05	1.00	18.81	C	0.3	
WB	TH-RT	0.33	0.31	100.0	19.92	525	0.14	1.00	20.06	C	3.3	
NB	LT	1.41	0.37	100.0	31.67	348	311.84	1.00	343.51	F	52.7	
NB	TH-RT	0.80	0.37	100.0	21.61	1319	2.52	1.00	24.12	C	17.7	
SB	LT-TH	1.19	0.21	100.0	31.56	613	112.59	1.00	144.15	F	35.5	
SB	RT	0.21	0.21	100.0	24.62	329	0.05	1.00	24.66	C	1.5	

DIR	Delay	LOS
EB	75.51	F
WB	19.95	C
NB	125.80	F
SB	133.96	F

INTERSECTION DELAY =110.02 INTERSECTION LOS=F

THE CYCLE LENGTH WITHIN THE BOUNDS OF 100 TO 100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE 230.2 SECONDS
for chosen cycle length 100.0
suggested timing phase 1 is 28.9 secs green, 5.0 secs yellow + red clear
suggested timing phase 2 is 0.0 secs green, 22.0 secs yellow + red clear
suggested timing phase 3 is 17.9 secs green, 0.0 secs yellow + red clear
suggested timing phase 4 is 21.2 secs green. 5.0 secs yellow + red clear

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CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
JOSLIN: RIVERWAY/LONGWOOD
EXISTING (1989) PM PEAK HOUR
date:03-05-1991              time:16:10:55
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=RWLWEXPM   GEOMETRICS=RWLWEXAM   SIGNAL=RWLWEXPM
LOCATED IN CBD:n
VOLUME & GEOMETRICS
       VOLUMES      # OF LANES     LANE WIDTH     CROSS
DIR  LT   TH   RT    LT TH RT      LT   TH   RT    WALK
EB   47  166  385     0  1  1     0.0 11.0 10.0    34
WB   32  351    8     1  1  0     9.0  9.0  0.0    34
NB  239  618  126     1  2  0    11.0 10.0  0.0    59
SB    9 1024  151     0  2  1     0.0 10.5 10.0    59

TRAFFIC & ROADWAY CONDITIONS
                ADJ PARK              PEDESTRIANS       ARR
DIR GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
EB  0.0%  0.7%   N     0     0  .940    0   y    15.5    3
WB -2.0%  1.5%   N     0     0  .940    0   y    15.5    3
NB  0.0%  0.1%   N     0     0  .940    0   y    21.8    3
SB  0.0%  0.0%   N     0     0  .940    0   Y    21.8    3

PHASINGS
   EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
   l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1 #  #  #     #  #  #                              45.0   3    P
 2          #           #           #           #   0.0  22    P
 3       #                 #  #  #                  28.0   0    P
 4                         #  #  #     #  #  #      59.0   0    P

CYCLE= 157.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)
DIR  LTV  THV  RTV   PHF  LTFR THFR RTFR
EB    47  166  385  .940    50  177  410
WB    32  351    8  .940    34  373    9
NB   239  618  126  .940   254  657  134
SB     9 1024  151  .940    10 1089  161

PART 2 (LANE GROUP ADJUSTMENTS)
DIR LN GROUP  FLOW N   LU     v  Plt  Prt
EB  LT-TH      227 1 1.00   227 0.22 0.00
EB  RT         410 1 1.00   410 0.00 1.00
WB  LT          34 1 1.00    34 1.00 0.00
WB  TH-RT      382 1 1.00   382 0.00 0.02
NB  LT         254 1 1.00   254 1.00 0.00
NB  TH-RT      791 2 1.05   831 0.00 0.17
SB  LT-TH     1099 2 1.05  1154 0.01 0.00
SB  RT         161 1 1.00   161 0.00 1.00

PART 3 (OPPOSING VOLUME ADJUSTMENTS)
LEFT TURN                 OPPOSING APPROACH
BEING OPPOSED       VOLUMES      % OPPOSING LEFT TURN     # LANES      OPPOSING
                 LT   TH   RT        LT   TH   RT       LT  TH  RT      VOLUME
EASTBOUND        34  373    9       100  100  100        1   1   0       382
WESTBOUND        50  177  410       100  100    0        0   1   1       177
NORTHBOUND       10 1089  161       100  100    0        0   2   1      1099
SOUTHBOUND      254  657  134         0   68   68        1   2   0       537

SATURATION FLOW ADJUSTMENT WORKSHEET
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DIR	LN GROUP	IDEAL	N	Fwid	Fhv	Fgr	Fpark	Fbus	Farea	Frt	Flt	s
EB	LT-TH	1950	1	0.967	0.997	1.000	1.000	1.000	1.000	1.000	0.489	919
EB	RT	1950	1	0.933	0.997	1.000	1.000	1.000	1.000	0.850	1.000	1542
WB	LT	1950	1	0.900	0.993	1.010	1.000	1.000	1.000	1.000	0.549	966
WB	TH-RT	1950	1	0.900	0.993	1.010	1.000	1.000	1.000	0.997	1.000	1753
NB	LT	1950	1	0.967	1.000	1.000	1.000	1.000	1.000	1.000	0.950	1790
NB	TH-RT	1950	2	0.933	1.000	1.000	1.000	1.000	1.000	0.975	1.000	3546
SB	LT-TH	1950	2	0.950	1.000	1.000	1.000	1.000	1.000	1.000	0.989	3664
SB	RT	1950	1	0.933	1.000	1.000	1.000	1.000	1.000	0.850	1.000	1547

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT

INPUT VARIABLES

DIR	C	G	N	Va	Vm	Vlt	Plt	No	Vo	Plto
EB	157	45	1	227	586	50	0.22	1	382	0.00
WB	157	45	1	34	382	34	1.00	1	177	0.22
SB	157	59	2	1099	1260	10	0.01	2	537	0.00

CALCULATIONS

DIR	Soo	Yo	Gu	Fs	Pl	Gq	Pt	Gf	El	Fm	Flt
EB	1800	0.212	14.836	0.636	0.221	30.164	0.779	6.899	1.768	0.489	0.489
WB	1539	0.115	30.484	0.765	1.000	14.516	0.000	0.000	1.471	0.549	0.549
SB	3600	0.149	41.828	0.540	0.028	17.172	0.972	15.045	2.085	0.978	0.989

CAPACITY ANALYSIS WORKSHEET

DIR	LN GROUP	v	s	v/s	g/C	c	v/c	CRITICAL
EB	LT-TH	227	919	0.25	0.29	264	0.86	*
EB	RT	410	1542	0.27	0.46	717	0.57	
WB	LT	34	966	0.04	0.29	277	0.12	
WB	TH-RT	382	1753	0.22	0.29	503	0.76	
NB	LT	254	1790	0.11	0.18	397	0.64	*
NB	TH-RT	831	3546	0.23	0.55	1965	0.42	
SB	LT-TH	1154	3664	0.31	0.38	1377	0.84	*
SB	RT	161	1547	0.10	0.38	581	0.28	

CYCLE=157.0 LOST=25.0 SUM V/S CRIT= 0.68 TOTAL V/C= 0.80

FOR THE NORTHBOUND PROTECTED/PERMISSIVE LEFT TURN LANE THE CAPACITY, V/S AND V/C RATIOS HAVE ALL BEEN ADJUSTED TO REFLECT A CAPACITY FOR 48 LEFT TURNS ON THE CHANGE INTERVAL AND 30 ON THE PERMISSIVE PHASE

LEVEL OF SERVICE WORKSHEET

DIR	LN GROUP	v/c	g/C	C	d1	c	d2	PF	Delay	LOS	Avg Q	95% Q
EB	LT-TH	0.86	0.29	157.0	40.29	264	16.35	1.00	56.64	E	7.1	
EB	RT	0.57	0.46	157.0	23.26	717	0.83	1.00	24.08	C	9.6	
WB	LT	0.12	0.29	157.0	31.47	277	0.01	1.00	31.48	D	1.1	
WB	TH-RT	0.76	0.29	157.0	38.82	503	4.59	1.00	43.41	E	11.9	
NB	LT	0.64	0.55	157.0	18.38	397	2.43	1.00	20.81	C	9.1	
NB	TH-RT	0.42	0.55	157.0	15.49	1965	0.09	1.00	15.58	C	15.4	
SB	LT-TH	0.84	0.38	157.0	33.93	1377	3.36	1.00	37.29	D	29.9	
SB	RT	0.28	0.38	157.0	25.94	581	0.07	1.00	26.01	D	4.4	

DIR	Delay	LOS
EB	35.68	D
WB	42.43	E
NB	16.81	C
SB	35.91	D

INTERSECTION DELAY = 30.65 INTERSECTION LOS=D

THE CYCLE LENGTH WITHIN THE BOUNDS OF 100 TO 100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE 86.5 SECONDS
for chosen cycle length 100.0
suggested timing phase 1 is 27.4 secs green. 3.0 secs yellow + red clear
suggested timing phase 2 is 0.0 secs green. 22.0 secs yellow + red clear
suggested timing phase 3 is 12.7 secs green. 0.0 secs yellow + red clear
suggested timing phase 4 is 35.0 secs green. 0.0 secs yellow + red clear

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
JOSLIN: RIVERWAY/LONGWOOD
NO-BUILD 1993 PM PEAK HOUR
date:03-06-1991 time:10:12:32
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=rwlwnbom GEOMETRICS=rwlwnbom SIGNAL=rwlwnbom
LOCATED IN CBD:n

VOLUME & GEOMETRICS

	VOLUMES			# OF LANES			LANE WIDTH			CROSS
DIR	LT	TH	RT	LT	TH	RT	LT	TH	RT	WALK
EB	60	176	386	0	1	1	0.0	11.0	10.0	34
WB	66	417	9	1	1	0	9.0	9.0	0.0	34
NB	252	637	128	1	2	0	11.0	10.0	0.0	59
SB	9	1300	163	0	2	1	0.0	10.5	10.0	59

TRAFFIC & ROADWAY CONDITIONS

			ADJ PARK				PEDESTRIANS			ARR
DIR	GRADE	%HV	Y/N	MOVES	BUSES	PHF	CROSS	BUT	MIN TIME	TYPE
EB	0.0%	0.7%	N	0	0	.940	0	y	15.5	3
WB	-2.0%	1.5%	N	0	0	.940	0	y	15.5	3
NB	0.0%	0.1%	N	0	0	.940	0	y	21.8	3
SB	0.0%	0.0%	N	0	0	.940	0	Y	21.8	3

PHASINGS

	EASTBOUND				WESTBOUND				NORTHBOUND				SOUTHBOUND				GREEN	Y+R	PRE/ACT
	l	t	r	p	l	t	r	p	l	t	r	p	l	t	r	p			
1	*	*	*		*	*	*										25.8	3	P
2				*				*				*				*	0.0	22	P
3			*						*	*	*						10.4	0	P
4									*	*	*		*	*	*		38.8	0	P

CYCLE= 100.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)

DIR	LTV	THV	RTV	PHF	LTFR	THFR	RTFR
EB	60	176	386	.940	64	187	411
WB	66	417	9	.940	70	444	10
NB	252	637	128	.940	268	678	136
SB	9	1300	163	.940	10	1383	173

PART 2 (LANE GROUP ADJUSTMENTS)

DIR	LN GROUP	FLOW	N	LU	v	Plt	Prt
EB	LT-TH	251	1	1.00	251	0.25	0.00
EB	RT	411	1	1.00	411	0.00	1.00
WB	LT	70	1	1.00	70	1.00	0.00
WB	TH-RT	453	1	1.00	453	0.00	0.02
NB	LT	268	1	1.00	268	1.00	0.00
NB	TH-RT	814	2	1.05	855	0.00	0.17
SB	LT-TH	1393	2	1.05	1462	0.01	0.00
SB	RT	173	1	1.00	173	0.00	1.00

PART 3 (OPPOSING VOLUME ADJUSTMENTS)

LEFT TURN	OPPOSING APPROACH									
BEING OPPOSED	VOLUMES			% OPPOSING LEFT TURN			# LANES			OPPOSING
	LT	TH	RT	LT	TH	RT	LT	TH	RT	VOLUME
EASTBOUND	70	444	10	100	100	100	1	1	0	453
WESTBOUND	64	187	411	100	100	0	0	1	1	187
NORTHBOUND	10	1383	173	100	100	0	0	2	1	1393
SOUTHBOUND	268	678	136	0	79	79	1	2	0	641

SATURATION FLOW ADJUSTMENT WORKSHEET
DIR LN GROUP IDEAL N Fwid Fhv Fgr Fpark Fbus Farea Frt Flt s

EB	LT-TH	1950	1	0.967	0.997	1.000	1.000	1.000	1.000	1.000	0.344	647
EB	RT	1950	1	0.933	0.997	1.000	1.000	1.000	1.000	0.850	1.000	1542
WB	LT	1950	1	0.900	0.993	1.010	1.000	1.000	1.000	1.000	0.544	958
WB	TH-RT	1950	1	0.900	0.993	1.010	1.000	1.000	1.000	0.997	1.000	1754
NB	LT	1950	1	0.967	1.000	1.000	1.000	1.000	1.000	1.000	0.950	1790
NB	TH-RT	1950	2	0.933	1.000	1.000	1.000	1.000	1.000	0.975	1.000	3547
SB	LT-TH	1950	2	0.950	1.000	1.000	1.000	1.000	1.000	1.000	1.000	3705
SB	RT	1950	1	0.933	1.000	1.000	1.000	1.000	1.000	0.850	1.000	1547

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT

INPUT VARIABLES

DIR	C	G	N	Va	Vm	Vlt	Plt	No	Vo	Plto
EB	100	26	1	251	598	64	0.25	1	453	0.00
WB	100	26	1	70	453	70	1.00	1	187	0.25
SB	100	39	2	1393	1399	10	0.01	2	641	0.00

CALCULATIONS

DIR	Soo	Yo	Gu	Fs	Pl	Go	Pt	Gf	El	Fm	Flt
EB	1800	0.252	0.793	0.592	0.254	24.978	0.746	5.716	1.901	0.344	0.344
WB	1464	0.128	14.890	0.758	1.000	10.881	0.000	0.000	1.484	0.544	0.544
SB	3600	0.178	25.517	0.474	0.023	13.265	0.977	12.152	2.372	1.000	1.000

CAPACITY ANALYSIS WORKSHEET

DIR	LN GROUP	v	s	v/s	g/C	c	v/c	CRITICAL
EB	LT-TH	251	647	0.39	0.26	167	1.51	*
EB	RT	411	1542	0.27	0.36	558	0.74	
WB	LT	70	958	0.07	0.26	247	0.28	
WB	TH-RT	453	1754	0.26	0.26	452	1.00	
NB	LT	268	1790	0.11	0.10	262	1.02	*
NB	TH-RT	855	3547	0.24	0.49	1746	0.49	
SB	LT-TH	1462	3705	0.39	0.39	1437	1.02	*
SB	RT	173	1547	0.11	0.39	600	0.29	

CYCLE=100.0 LOST=25.0 SUM V/S CRIT= 0.89 TOTAL V/C= 1.19

FOR THE NORTHBOUND PROTECTED/PERMISSIVE LEFT TURN LANE THE CAPACITY. V/S AND V/C RATIOS HAVE ALL BEEN ADJUSTED TO REFLECT A CAPACITY FOR 75 LEFT TURNS ON THE CHANGE INTERVAL AND 0 ON THE PERMISSIVE PHASE

LEVEL OF SERVICE WORKSHEET

DIR	LN GROUP	v/c	g/C	C	d1	c	d2	PF	Delay	LOS	Avg Q	95% Q
EB	LT-TH	1.51	0.26	100.0	34.23	167	447.95	1.00	482.18	F	36.2	
EB	RT	0.74	0.36	100.0	21.07	558	3.48	1.00	24.55	C	7.3	
WB	LT	0.28	0.26	100.0	22.59	247	0.18	1.00	22.77	C	1.4	
WB	TH-RT	1.00	0.26	100.0	28.23	452	33.25	1.00	61.48	F	12.4	
NB	LT	1.02	0.49	100.0	19.71	262	49.21	1.00	68.92	F	8.5	
NB	TH-RT	0.49	0.49	100.0	12.90	1746	0.18	1.00	13.09	B	11.5	
SB	LT-TH	1.02	0.39	100.0	23.53	1437	22.49	1.00	46.01	E	29.6	
SB	RT	0.29	0.39	100.0	16.04	600	0.08	1.00	16.12	C	2.9	

DIR	Delay	LOS
EB	198.19	F
WB	56.29	E
NB	26.42	D
SB	42.84	E

INTERSECTION DELAY = 66.02 INTERSECTION LOS=F

THE CYCLE LENGTH WITHIN THE BOUNDS OF 100 TO 100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE 394.0 SECONDS
for chosen cycle length 100.0
suggested timing phase 1 is 32.7 secs green. 3.0 secs yellow + red clear
suggested timing phase 2 is 0.0 secs green. 22.0 secs yellow + red clear
suggested timing phase 3 is 9.0 secs green. 0.0 secs yellow + red clear
suggested timing phase 4 is 33.3 secs green. 0.0 secs yellow + red clear

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CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
JOSLIN: RIVERWAY/LONGWOOD
BUILD 1993 PM PEAK HOUR
date:03-06-1991           time:10:14:21
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=RWLWBPM    GEOMETRICS=rwlwnbom   SIGNAL=rwlwnbom
LOCATED IN CBD:n
VOLUME & GEOMETRICS
       VOLUMES      # OF LANES     LANE WIDTH     CROSS
DIR  LT   TH   RT    LT TH RT      LT   TH   RT    WALK
EB   60  176  386     0  1  1      0.0 11.0 10.0   34
WB   66  420   12     1  1  0      9.0  9.0  0.0   34
NB  252  637  128     1  2  0     11.0 10.0  0.0   59
SB    9 1300  163     0  2  1      0.0 10.5 10.0   59

TRAFFIC & ROADWAY CONDITIONS
                 ADJ PARK             PEDESTRIANS       ARR
DIR GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
EB  0.0%  0.7%   N     0     0   .940    0   y    15.5    3
WB -2.0%  1.5%   N     0     0   .940    0   y    15.5    3
NB  0.0%  0.1%   N     0     0   .940    0   y    21.8    3
SB  0.0%  0.0%   N     0     0   .940    0   Y    21.8    3

PHASINGS
    EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
    l  t  r  o  l  t  r  o  l  t  r  o  l  t  r  o
 1  #  #  #     #  #  #                              25.8   3    P
 2           #           #           #           #    0.0  22    P
 3        #                 #  #  #                  10.4   0    P
 4                          #  #  #     #  #  #      38.8   0    P

CYCLE= 100.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)
DIR  LTV  THV  RTV   PHF  LTFR THFR RTFR
EB    60  176  386  .940    64  187  411
WB    66  420   12  .940    70  447   13
NB   252  637  128  .940   268  678  136
SB     9 1300  163  .940    10 1383  173

PART 2 (LANE GROUP ADJUSTMENTS)
DIR LN GROUP  FLOW N  LU     v  Plt  Prt
EB  LT-TH      251 1 1.00  251 0.25 0.00
EB  RT         411 1 1.00  411 0.00 1.00
WB  LT          70 1 1.00   70 1.00 0.00
WB  TH-RT      460 1 1.00  460 0.00 0.03
NB  LT         268 1 1.00  268 1.00 0.00
NB  TH-RT      814 2 1.05  855 0.00 0.17
SB  LT-TH     1393 2 1.05 1462 0.01 0.00
SB  RT         173 1 1.00  173 0.00 1.00

PART 3 (OPPOSING VOLUME ADJUSTMENTS)
LEFT TURN                OPPOSING APPROACH
BEING OPPOSED       VOLUMES      % OPPOSING LEFT TURN    # LANES     OPPOSING
                  LT   TH   RT       LT   TH   RT       LT  TH  RT    VOLUME
EASTBOUND         70  447   13      100  100  100        1   1   0     460
WESTBOUND         64  187  411      100  100    0        0   1   1     187
NORTHBOUND        10 1383  173      100  100    0        0   2   1    1393
SOUTHBOUND       268  678  136        0   79   79        1   2   0     641

SATURATION FLOW ADJUSTMENT WORKSHEET
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DIR	LN GROUP	IDEAL	N	Fwid	Fhv	Fgr	Fpark	Fbus	Farea	Frt	Flt	s
EB	LT-TH	1950	1	0.967	0.997	1.000	1.000	1.000	1.000	1.000	0.330	619
EB	RT	1950	1	0.933	0.997	1.000	1.000	1.000	1.000	0.850	1.000	1542
WB	LT	1950	1	0.900	0.993	1.010	1.000	1.000	1.000	1.000	0.544	956
WB	TH-RT	1950	1	0.900	0.993	1.010	1.000	1.000	1.000	0.996	1.000	1752
NB	LT	1950	1	0.967	1.000	1.000	1.000	1.000	1.000	1.000	0.950	1790
NB	TH-RT	1950	2	0.933	1.000	1.000	1.000	1.000	1.000	0.975	1.000	3547
SB	LT-TH	1950	2	0.950	1.000	1.000	1.000	1.000	1.000	1.000	1.000	3705
SB	RT	1950	1	0.933	1.000	1.000	1.000	1.000	1.000	0.850	1.000	1547

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT

INPUT VARIABLES

DIR	C	G	N	Va	Vm	Vlt	Plt	No	Vo	Plto
EB	100	26	1	251	598	64	0.25	1	460	0.00
WB	100	26	1	70	460	70	1.00	1	187	0.25
SB	100	39	2	1393	1399	10	0.01	2	641	0.00

CALCULATIONS

DIR	Soo	Yo	Gu	Fs	Pl	Go	Ft	Gf	El	Fm	Flt
EB	1800	0.255	0.321	0.588	0.254	25.450	0.746	5.726	1.914	0.330	0.330
WB	1461	0.128	14.856	0.758	1.000	10.915	0.000	0.000	1.484	0.544	0.544
SB	3600	0.178	25.517	0.474	0.023	13.265	0.977	12.152	2.372	1.000	1.000

CAPACITY ANALYSIS WORKSHEET

DIR	LN GROUP	v	s	v/s	g/C	c	v/c	CRITICAL
EB	LT-TH	251	619	0.41	0.26	160	1.57	*
EB	RT	411	1542	0.27	0.36	558	0.74	
WB	LT	70	956	0.07	0.26	246	0.28	
WB	TH-RT	460	1752	0.26	0.26	452	1.02	
NB	LT	268	1790	0.11	0.10	262	1.02	*
NB	TH-RT	855	3547	0.24	0.49	1746	0.49	
SB	LT-TH	1462	3705	0.39	0.39	1437	1.02	*
SB	RT	173	1547	0.11	0.39	600	0.29	

CYCLE=100.0 LOST=25.0 SUM V/S CRIT= 0.91 TOTAL V/C= 1.21

FOR THE NORTHBOUND PROTECTED/PERMISSIVE LEFT TURN LANE THE CAPACITY. V/S AND V/C RATIOS HAVE ALL BEEN ADJUSTED TO REFLECT A CAPACITY FOR 75 LEFT TURNS ON THE CHANGE INTERVAL AND 0 ON THE PERMISSIVE PHASE

LEVEL OF SERVICE WORKSHEET

DIR	LN GROUP	v/c	g/C	C	d1	c	d2	PF	Delay	LOS	Avg Q	95% Q
EB	LT-TH	1.57	0.26	100.0	35.22	160	544.16	1.00	579.38	F	43.0	
EB	RT	0.74	0.36	100.0	21.07	558	3.48	1.00	24.55	C	7.3	
WB	LT	0.28	0.26	100.0	22.60	246	0.18	1.00	22.78	C	1.4	
WB	TH-RT	1.02	0.26	100.0	28.38	452	37.39	1.00	65.77	F	13.1	
NB	LT	1.02	0.49	100.0	19.71	262	49.21	1.00	68.92	F	8.5	
NB	TH-RT	0.49	0.49	100.0	12.90	1746	0.18	1.00	13.09	B	11.5	
SB	LT-TH	1.02	0.39	100.0	23.53	1437	22.49	1.00	46.01	E	29.6	
SB	RT	0.29	0.39	100.0	16.04	600	0.08	1.00	16.12	C	2.9	

DIR	Delay	LOS
EB	235.07	F
WB	60.07	F
NB	26.42	D
SB	42.84	E

INTERSECTION DELAY = 72.69 INTERSECTION LOS=F

THE CYCLE LENGTH WITHIN THE BOUNDS OF 100 TO 100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE 550.6 SECONDS
for chosen cycle length 100.0
suggested timing phase 1 is 33.5 secs green. 3.0 secs yellow + red clear
suggested timing phase 2 is 0.0 secs green. 22.0 secs yellow + red clear
suggested timing phase 3 is 8.8 secs green. 0.0 secs yellow + red clear
suggested timing phase 4 is 32.6 secs green. 0.0 secs yellow + red clear

CINCH PROGRAM VERSION DATE 2-6-1987
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
LONGWOOD/BROOKLINE
1990 COUNTS AFTER RESTRIPING AM PEAK HOUR
date:10-08-1990 time:13:52:40
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=MCAEXAM GEOMETRICS=MCAEXAM SIGNAL=AMMCAEX
LOCATED IN CBD:N
VOLUME & GEOMETRICS

	VOLUMES			# OF LANES			LANE WIDTH			CROSS
DIR	LT	TH	RT	LT	TH	RT	LT	TH	RT	WALK
EB	106	177	40	1	1	0	10.0	11.0	0.0	40
WB	63	114	169	1	1	0	10.0	10.0	0.0	40
NB	44	824	153	1	2	0	11.0	12.0	0.0	60
SB	249	500	94	1	2	0	11.0	12.0	0.0	60

TRAFFIC & ROADWAY CONDITIONS

			ADJ PARK				PEDESTRIANS			ARR
DIR	GRADE	%HV	Y/N	MOVES	BUSES	PHF	CROSS	BUT	MIN TIME	TYPE
EB	0.0%	13.6%	N	0	0	.840	10	Y	17.0	3
WB	1.0%	5.6%	N	0	0	.880	10	Y	17.0	3
NB	0.0%	5.9%	N	0	0	.980	35	Y	22.0	3
SB	0.0%	2.2%	N	0	0	.980	30	Y	22.0	3

PHASINGS

	EASTBOUND				WESTBOUND				NORTHBOUND				SOUTHBOUND				GREEN	Y+R	PRE/ACT
	l	t	r	p	l	t	r	p	l	t	r	p	l	t	r	p			
1	*	*	*		*	*	*										23.0	4	A
2													*	*	*		15.0	0	A
3									*	*	*		*	*	*		44.0	4	A
4				*				*				*				*	0.0	12	A

CYCLE= 102.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)

DIR	LTV	THV	RTV	PHF	LTFR	THFR	RTFR
EB	106	177	40	.840	126	211	48
WB	63	114	169	.880	72	130	192
NB	44	824	153	.980	45	841	156
SB	249	500	94	.980	254	510	96

PART 2 (LANE GROUP ADJUSTMENTS)

DIR	LN GROUP	FLOW	N	LU	v	Plt	Prt
EB	LT	126	1	1.00	126	1.00	0.00
EB	TH-RT	258	1	1.00	258	0.00	0.18
WB	LT	72	1	1.00	72	1.00	0.00
WB	TH-RT	322	1	1.00	322	0.00	0.60
NB	LT	45	1	1.00	45	1.00	0.00
NB	TH-RT	997	2	1.05	1047	0.00	0.16
SB	LT	254	1	1.00	254	1.00	0.00
SB	TH-RT	606	2	1.05	636	0.00	0.16

PART 3 (OPPOSING VOLUME ADJUSTMENTS)

LEFT TURN	OPPOSING APPROACH									
BEING OPPOSED	VOLUMES			% OPPOSING LEFT TURN			# LANES			OPPOSING
	LT	TH	RT	LT	TH	RT	LT	TH	RT	VOLUME
EASTBOUND	72	130	192	100	100	100	1	1	0	322
WESTBOUND	126	211	48	100	100	100	1	1	0	256
NORTHBOUND	254	510	96	0	75	75	1	2	0	452
SOUTHBOUND	45	841	156	100	100	100	1	2	0	997

[illegible]

EB	LT	1950	1	0.933	0.936	1.000	1.000	1.000	1.000	1.000	0.325	555
EB	TH-RT	1950	1	0.967	0.936	1.000	1.000	1.000	1.000	0.972	1.000	1716
WB	LT	1950	1	0.933	0.973	0.995	1.000	1.000	1.000	1.000	0.443	781
WB	TH-RT	1950	1	0.933	0.973	0.995	1.000	1.000	1.000	0.910	1.000	1604
NB	LT	1950	1	0.967	0.971	1.000	1.000	1.000	1.000	1.000	0.518	948
NB	TH-RT	1950	2	1.000	0.971	1.000	1.000	1.000	1.000	0.977	1.000	3699
SB	LT	1950	1	0.967	0.989	1.000	1.000	1.000	1.000	1.000	0.950	1771
SB	TH-RT	1950	2	1.000	0.989	1.000	1.000	1.000	1.000	0.976	1.000	3766

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT

INPUT VARIABLES

DIR	C	G	N	Va	Vm	Vit	Flt	No	Vo	Plto
EB	102	23	1	126	258	126	1.00	1	322	0.00
WB	102	23	1	72	322	72	1.00	1	258	0.00
NB	102	44	1	45	997	45	1.00	2	452	0.00

CALCULATIONS

DIR	Sop	Yo	Gu	Fs	Pl	Gq	Pt	Gf	El	Fm	Flt
EB	1800	0.179	5.816	0.674	1.000	17.184	0.000	0.000	1.669	0.325	0.325
WB	1800	0.144	[illegible]	0.714	1.000	17.238	0.000	0.000	1.577	0.443	0.443
NB	1800	0.125	38.572	0.592	1.000	8.326	0.000	0.000	1.899	0.518	0.518

CAPACITY ANALYSIS WORKSHEET

DIR	LN GROUP	v	s	v/s	g/C	c	v/c	CRITICAL
EB	LT	126	555	0.23	0.23	125	1.01	*
EB	TH-RT	258	1716	0.15	0.23	387	0.67	
WB	LT	72	781	0.09	0.23	176	0.41	
WB	TH-RT	322	1604	0.20	0.23	362	0.89	
NB	LT	45	948	0.05	0.43	409	0.11	
NB	TH-RT	[illegible]	3699	[illegible]	0.43	1595	[illegible]	*
SB	LT	254	1771	0.09	0.15	423	0.60	*
SB	TH-RT	635	3766	0.17	0.58	2178	0.29	

CYCLE=102.0 LOST=20.0 SUM V/S CRIT= 0.60 TOTAL V/C= 0.74

FOR THE SOUTHBOUND PROTECTED/PERMISSIVE LEFT TURN LANE THE CAPACITY, V/S AND V/C RATIOS HAVE ALL BEEN ADJUSTED TO REFLECT A CAPACITY FOR [illegible] LEFT TURNS ON THE CHANGE INTERVAL AND 89 ON THE PERMISSIVE PHASE

LEVEL OF SERVICE WORKSHEET

DIR	LN GROUP	v/c	g/C	C	d1	c	d2	PF	Delay	LOS	Avg Q	95% Q
EB	LT	1.01	0.23	102.0	39.10	125	54.96	0.85	80.81	F	4.2	
EB	TH-RT	0.67	0.23	102.0	37.37	387	3.02	0.85	25.83	D	5.7	
WB	LT	0.41	0.23	102.0	35.60	176	0.87	0.85	22.50	C	1.6	
WB	TH-RT	0.89	0.23	102.0	39.08	362	15.93	0.85	38.26	D	7.1	
NB	LT	0.11	0.43	102.0	13.16	409	0.01	0.85	11.19	B	0.7	
NB	TH-RT	0.66	0.43	102.0	17.46	1595	0.76	0.85	15.45	C	16.1	
SB	LT	0.60	0.58	102.0	10.56	423	1.72	1.00	12.28	B	6.1	
SB	TH-RT	0.29	0.58	102.0	8.29	2178	0.02	0.85	7.06	B	7.2	

DIR	Delay	LOS
EB	43.57	E
WB	35.39	D
NB	15.29	C
SB	8.55	B

INTERSECTION DELAY = 19.96 INTERSECTION LOS=C

THE CYCLE LENGTH WITHIN THE BOUNDS OF 102 TO 102 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 102.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE 54.1 SECONDS

for chosen cycle length 102.0
suggested timing phase 1 is 31.2 secs green, 4.0 secs yellow + red clear
suggested timing phase 2 is 12.1 secs green, 0.0 secs yellow + red clear
suggested timing phase 3 is 35.7 secs green, 4.0 secs yellow + red clear
suggested timing phase 4 is 0.0 secs green, 12.0 secs yellow + red clear

HCS- PROGRAM VERSION DATE 4-29-1988

1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS

[illegible]:LONGWOOD-[illegible]LINE

AM PEAK HOUR (1993) NO-BUILD

date: 0?-05-1991 time:15:02:51

LAST DATA SET NAMES LOADED OR SAVED

VOLUME=SRLANEAM GEOMETRICS=SRLANEAM SIGNAL=SRLANEAM

LOCATED IN DB0:.

VOLUME & GEOMETRICS

	VOLUMES			# OF LANES			LANE WIDTH			CROSS
DIR	LT	TH	RT	LT	TH	RT	LT	TH	RT	WALK
EB	1[illegible]	1[illegible]	112	1	1		1?.0	11.[illegible]	[illegible]	4
WB	117	142	24?	1	1		10.[illegible]	10.[illegible]	0.0	40
NB	49	9?2	152	1	2	0	11.0	12.[illegible]	[illegible]	50
SB	258	?74	111	1	2	0	11.0	12.0	0.0	50

TRAFFIC & ROADWAY CONDITIONS

			ADJ PARK				PEDESTRIANS			ARR
DIR	GRADE	%HV	Y/N	MOVES	BUSES	PHF	CROSS	BUT	MIN TIME	TYPE
EB	0.0%	10.6%	N	0		.840	10	Y	17.[illegible]	3
WB	0.0%	5.6%	N	0	0	.880	10	Y	17.[illegible]	3
NB	[illegible]	5.9%	N	0		.930	75	Y	22.[illegible]	3
SB	[illegible]	2.2%	N	0	0	.93	75	Y	22.[illegible]	3

PHASINGS

	EASTBOUND				WESTBOUND				NORTHBOUND				SOUTHBOUND				GREEN	Y+R	PRE/ACT
	l	t	r	p	l	t	r	p	l	t	r	p	l	t	r	p			
1	*	*	*		*	*	*										47.0	4	A
2													*	*	*		7.8	0	A
3									*	*	*		*	*	*		24.?	4	A
4				*				*				*				*	0.0	12	P

CYCLE= 1?[illegible]

VOLUME ADJUSTMENT WORKSHEET

PART 1 (MOVEMENT ADJUSTMENTS)

DIR	LTV	THV	RTV	PHF	LTFF	THFF	RTFF
EB	161	196	102	.84	192	2??	121
WB	117	142	24	.88	128	161	277
NB	49	9?2	152	.930	50	1112	186
SB	258	?74	111	.95	267	516	113

PART 2 LANE GROUP ADJUSTMENTS

DIR	LN GROUP	FLOW	N	UL	V	Plt	Prt
EB	LT	192	1	1.00	192	1.00	0.00
EB	TH+RT	355	1	1.00	355	0.00	0.34
WB	LT	128	1	1.00	128	1.00	0.00
WB	TH+RT	434	1	1.00	434	0.00	0.6?
NB	LT	5?	1	1.00	5?	1.00	0.00
NB	TH+RT	1198	2	1.05	1258	0.00	0.15
SB	LT	267	1	1.00	267	1.00	0.00
SB	TH+RT	72?	2	1.05	756	0.00	0.15

PART 3 (OPPOSING VOLUME ADJUSTMENTS)

LEFT TURN	OPPOSING APPROACH									
BEING OPPOSED	VOLUMES			% OPPOSING LEFT TURN			# LANES			OPPOSING
	LT	TH	RT	LT	TH	RT	LT	TH	RT	VOLUME
EASTBOUND	128	161	277	100	100	100	1	1	0	434
WESTBOUND	192	2??	121	100	100	100	1	1	0	355
NORTHBOUND	267	516	113	0	76	76	1	2	0	556
SOUTHBOUND	50	1112	186	100	100	100	1	2	0	1198

SATURATION FLOW ADJUSTMENT WORKSHEET

DIR LN GROUP IDEAL N Fwid Fhv For Fpark Fbus Farea Frt Flt S

```
EB  LT         1950  1 0.933 0.936 1.000 1.000 1.000 1.000 1.000 0.431  735
EB  TH-RT      1950  1 0.967 0.936 1.000 1.000 1.000 1.000 0.949 1.000 1674
WB  LT         1950  1 0.933 0.973 0.995 1.000 1.000 1.000 1.000 0.507  892
WB  TH-RT      1950  1 0.933 0.973 0.995 1.000 1.000 1.000 0.906 1.000 1596
NB  LT         1950  1 0.967 0.971 1.000 1.000 1.000 1.000 1.000 0.371  680
NB  TH-RT      1950  2 1.000 0.971 1.000 1.000 1.000 1.000 0.977 1.000 3700
SB  LT         1950  1 0.967 0.989 1.000 1.000 1.000 1.000 1.000 0.950 1771
SB  TH-RT      1950  2 1.000 0.989 1.000 1.000 1.000 1.000 0.977 1.000 3768

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES
DIR  C   G  N   Va   Vm  Vlt  Plt No   Vo Plto
EB 100  47  1  192  355  192 1.00  1  434 0.00
WB 100  47  1  128  434  128 1.00  1  355 0.00
NB 100  25  1   50 1198   50 1.00  2  556 0.00
CALCULATIONS
DIR Soo    Yo     Gu     Fs     Pl     Go     Pt     Gf       El    Fm   Flt
EB 1800 0.241 30.605 0.604 1.000 16.725 0.000  0.000    1.964 0.431 0.431
WB 1800 0.197 34.414 0.653 1.000 12.926 0.000  0.000    1.722 0.507 0.507
NB 3600 0.154 11.167 0.528 1.000 13.718 0.000  0.000    2.132 0.371 0.371

CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP    v    s  v/s  g/C    c  v/c  CRITICAL
EB  LT        192  735 0.26 0.47  348 0.55
EB  TH-RT     355 1674 0.21 0.47  793 0.45
WB  LT        128  892 0.14 0.47  422 0.30
WB  TH-RT     434 1596 0.27 0.47  755 0.57      *
NB  LT         50  680 0.07 0.25  169 0.30
NB  TH-RT    1258 3700 0.34 0.25  921 1.37      *
SB  LT        263 1771 0.10 0.08  212 1.24      *
SB  TH-RT     766 3768 0.20 0.33 1231 0.62

CYCLE=100.0  LOST=20.0  SUM V/S CRIT= 0.71 TOTAL V/C= 0.89
FOR THE SOUTHBOUND PROTECTED/PERMISSIVE LEFT TURN LANE THE CAPACITY, V/S AND V/C
 RATIOS HAVE ALL BEEN ADJUSTED TO REFLECT A CAPACITY FOR
 75 LEFT TURNS ON THE CHANGE INTERVAL AND  0 ON THE PERMISSIVE PHASE

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C   C     d1    c      d2   PF   Delay LOS Avg Q  95% Q
EB  LT        0.55 0.47 100.0  14.25  348    1.43 0.85   13.33  B   2.6
EB  TH-RT     0.45 0.47 100.0  13.37  793    0.28 0.85   11.60  B   5.2
WB  LT        0.30 0.47 100.0  12.31  422    0.13 0.85   10.57  B   1.9
WB  TH-RT     0.57 0.47 100.0  14.48  755    0.60 0.85   12.99  B   6.3
NB  LT        0.30 0.25 100.0  23.14  169    0.30 0.85   19.92  C   1.0
NB  TH-RT     1.37 0.25 100.0  32.45  921  246.43 0.85  237.07  F  91.4
SB  LT        1.24 0.33 100.0  26.96  212  167.32 1.00  196.28  F  17.7
SB  TH-RT     0.62 0.33 100.0  21.57 1231    0.71 0.85   18.99  C  12.6

DIR Delay LOS
EB  12.21  B
WB  12.44  B
NB 228.77  F
SB  64.33  F
INTERSECTION DELAY =110.01 INTERSECTION LOS=F

THE CYCLE LENGTH WITHIN THE BOUNDS OF  100  TO  100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE  78.7 SECONDS
for chosen cycle length 100.0
suggested timing phase 1 is  30.7 secs green.   4.0 secs yellow + red clear
suggested timing phase 2 is  10.9 secs green.   0.0 secs yellow + red clear
suggested timing phase 3 is  38.4 secs green.   4.0 secs yellow + red clear
suggested timing phase 4 is   0.0 secs green.  12.0 secs yellow + red clear
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CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
JOSLIN:LONGWOOD BROOKLINE
BUILD AM PEAK HOUR (1993)
date:03-05-1991           time:15:36:26
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=BRLWBAM    GEOMETRICS=BRLWNBAM   SIGNAL=BRLWNBAM
LOCATED IN CBD:N
VOLUME & GEOMETRICS
        VOLUMES      # OF LANES     LANE WIDTH     CROSS
DIR  LT   TH   RT    LT TH RT      LT   TH   RT    WALK
EB  161  197  102     1  1  0    10.0 11.0  0.0    40
WB  113  142  240     1  1  0    10.0 10.0  0.0    40
NB   57  992  182     1  2  0    11.0 12.0  0.0    60
SB  258  604  118     1  2  0    11.0 12.0  0.0    60

TRAFFIC & ROADWAY CONDITIONS
                 ADJ PARK              PEDESTRIANS       ARR
DIR GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
EB  0.0% 13.6%   N    0    0   .840   10   Y    17.0    3
WB  1.0%  5.6%   N    0    0   .880   10   Y    17.0    3
NB  0.0%  5.9%   N    0    0   .980   35   Y    22.0    3
SB  0.0%  2.2%   N    0    0   .980   30   Y    22.0    3

PHASINGS
    EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1  *  *  *     *  *  *                                47.3   4    A
 2                                      *  *  *         7.8   0    A
 3                          *  *  *     *  *  *        24.9   4    A
 4           *           *           *           *      0.0  12    A

CYCLE= 100.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)
DIR  LTV  THV  RTV   PHF  LTFR THFR RTFR
EB   161  197  102  .840   192  235  121
WB   113  142  240  .880   128  161  273
NB    57  992  182  .980    58 1012  186
SB   258  604  118  .980   263  616  120

PART 2 (LANE GROUP ADJUSTMENTS)
DIR LN GROUP  FLOW N   LU     v  Plt  Prt
EB  LT         192 1 1.00   192 1.00 0.00
EB  TH-RT      356 1 1.00   356 0.00 0.34
WB  LT         128 1 1.00   128 1.00 0.00
WB  TH-RT      434 1 1.00   434 0.00 0.63
NB  LT          58 1 1.00    58 1.00 0.00
NB  TH-RT     1198 2 1.05  1258 0.00 0.16
SB  LT         263 1 1.00   263 1.00 0.00
SB  TH-RT      737 2 1.05   774 0.00 0.16

PART 3 (OPPOSING VOLUME ADJUSTMENTS)
LEFT TURN                OPPOSING APPROACH
BEING OPPOSED       VOLUMES      % OPPOSING LEFT TURN    # LANES      OPPOSING
                  LT   TH   RT      LT   TH   RT       LT  TH  RT     VOLUME
EASTBOUND        128  161  273     100  100  100        1   1   0       434
WESTBOUND        192  235  121     100  100  100        1   1   0       356
NORTHBOUND       263  616  120       0   76   76        1   2   0       561
SOUTHBOUND        58 1012  186     100  100  100        1   2   0      1198

SATURATION FLOW ADJUSTMENT WORKSHEET
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DIR	LN GROUP	IDEAL	N	Fwid	Fhv	For	Fpark	Fbus	Farea	Frt	Flt	s
EB	LT	1950	1	0.933	0.936	1.000	1.000	1.000	1.000	1.000	0.431	735
EB	TH-RT	1950	1	0.967	0.936	1.000	1.000	1.000	1.000	0.949	1.000	1675
WB	LT	1950	1	0.933	0.973	0.995	1.000	1.000	1.000	1.000	0.505	890
WB	TH-RT	1950	1	0.933	0.973	0.995	1.000	1.000	1.000	0.906	1.000	1596
NB	LT	1950	1	0.967	0.971	1.000	1.000	1.000	1.000	1.000	0.367	672
NB	TH-RT	1950	2	1.000	0.971	1.000	1.000	1.000	1.000	0.977	1.000	3700
SB	LT	1950	1	0.967	0.989	1.000	1.000	1.000	1.000	1.000	0.950	1771
SB	TH-RT	1950	2	1.000	0.989	1.000	1.000	1.000	1.000	0.975	1.000	3763

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT

INPUT VARIABLES

DIR	C	G	N	Va	Vm	Vlt	Plt	No	Vo	Plto
EB	100	47	1	192	356	192	1.00	1	434	0.00
WB	100	47	1	128	434	128	1.00	1	356	0.00
NB	100	25	1	58	1198	58	1.00	2	561	0.00

CALCULATIONS

DIR	Soo	Yo	Gu	Fs	Pl	Go	Pt	Gf	El	Fm	Flt
EB	1800	0.241	30.605	0.604	1.000	16.735	0.000	0.000	1.864	0.431	0.431
WB	1800	0.198	34.360	0.653	1.000	12.980	0.000	0.000	1.724	0.505	0.505
NB	3600	0.156	11.008	0.524	1.000	13.877	0.000	0.000	2.146	0.367	0.367

CAPACITY ANALYSIS WORKSHEET

DIR	LN GROUP	v	s	v/s	g/C	c	v/c	CRITICAL
EB	LT	192	735	0.26	0.47	348	0.55	
EB	TH-RT	356	1675	0.21	0.47	793	0.45	
WB	LT	128	890	0.14	0.47	422	0.30	
WB	TH-RT	434	1596	0.27	0.47	755	0.57	*
NB	LT	58	672	0.09	0.25	167	0.35	
NB	TH-RT	1258	3700	0.34	0.25	921	1.37	*
SB	LT	263	1771	0.10	0.08	212	1.24	*
SB	TH-RT	774	3763	0.21	0.33	1229	0.63	

CYCLE=100.0 LOST=20.0 SUM V/S CRIT= 0.71 TOTAL V/C= 0.89

FOR THE SOUTHBOUND PROTECTED/PERMISSIVE LEFT TURN LANE THE CAPACITY. V/S AND V/C
RATIOS HAVE ALL BEEN ADJUSTED TO REFLECT A CAPACITY FOR
75 LEFT TURNS ON THE CHANGE INTERVAL AND 0 ON THE PERMISSIVE PHASE

LEVEL OF SERVICE WORKSHEET

DIR	LN GROUP	v/c	g/C	C	d1	c	d2	PF	Delay	LOS	Avg Q	95% Q
EB	LT	0.55	0.47	100.0	14.25	348	1.43	0.85	13.33	B	2.8	
EB	TH-RT	0.45	0.47	100.0	13.38	793	0.28	0.85	11.62	B	5.2	
WB	LT	0.30	0.47	100.0	12.31	422	0.13	0.85	10.58	B	1.9	
WB	TH-RT	0.57	0.47	100.0	14.48	755	0.80	0.85	12.99	B	6.3	
NB	LT	0.35	0.25	100.0	23.47	167	0.52	0.85	20.40	C	1.2	
NB	TH-RT	1.37	0.25	100.0	32.48	921	246.43	0.85	237.07	F	91.4	
SB	LT	1.24	0.33	100.0	28.96	212	167.32	1.00	196.28	F	17.7	
SB	TH-RT	0.63	0.33	100.0	21.69	1229	0.75	0.85	19.07	C	13.8	

DIR	Delay	LOS
EB	12.22	B
WB	12.44	B
NB	227.50	F
SB	64.07	F

INTERSECTION DELAY =109.59 INTERSECTION LOS=F

THE CYCLE LENGTH WITHIN THE BOUNDS OF 100 TO 100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE 78.7 SECONDS
for chosen cycle length 100.0
suggested timing phase 1 is 30.7 secs green. 4.0 secs yellow + red clear
suggested timing phase 2 is 10.9 secs green. 0.0 secs yellow + red clear
suggested timing phase 3 is 38.4 secs green. 4.0 secs yellow + red clear
suggested timing phase 4 is 0.0 secs green. 12.0 secs yellow + red clear

EB	LT	1950	1	0.933	0.992	1.000	1.000	1.000	1.000	1.000	0.118	212
EB	TH-RT	1950	1	0.967	0.992	1.000	1.000	1.000	1.000	0.978	1.000	1829
WB	LT	1950	1	0.933	1.000	0.995	1.000	1.000	1.000	1.000	0.549	994
WB	TH-RT	1950	1	0.933	1.000	0.995	1.000	1.000	1.000	0.928	1.000	1680
NB	LT	1950	1	0.967	0.986	1.000	1.000	1.000	1.000	1.000	0.371	689
NB	TH-RT	1950	2	1.000	0.986	1.000	1.000	1.000	1.000	0.981	1.000	3771
SB	LT	1950	1	0.967	0.985	1.000	1.000	1.000	1.000	1.000	0.950	1764
SB	TH-RT	1950	2	1.000	0.985	1.000	1.000	1.000	1.000	0.985	1.000	3784

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT

INPUT VARIABLES

DIR	C	G	N	Va	Vm	Vlt	Plt	No	Vo	Plto
EB	120	34	1	58	216	58	1.00	1	531	0.00
WB	120	34	1	214	531	214	1.00	1	216	0.00
NB	120	45	1	71	791	71	1.00	2	622	0.00

[illegible]

DIR	Eso	fo	Gu	Fs	PL	Gq	Pt	Gf	El	Fm	Flt
EB	1800	0.295	0.000	0.540	1.000	34.000	0.000	0.000	2.072	0.118	0.118
WB	[illegible]	[illegible]	22.289	0.740	1.000	11.711	0.000	0.000	1.520	0.549	0.549
NB	[illegible]	[illegible]	29.338	0.466	1.000	15.662	0.000	0.000	2.313	0.371	0.371

CAPACITY ANALYSIS WORKSHEET

DIR	LN GROUP	v	s	v/s	g/C	c	v/c	CRITICAL
EB	LT	58	212	0.26	0.28	60	0.97	
EB	TH-RT	216	1829	0.12	0.28	518	0.42	
WB	LT	214	994	0.22	0.28	282	0.76	
WB	TH-RT	531	1680	0.32	0.28	476	1.12	*
NB	LT	71	689	0.10	0.38	259	0.27	
NB	TH-RT	[illegible]	3771	0.22	0.38	1414	0.59	*
SB	LT	257	1764	0.08	0.13	407	0.63	*
SB	TH-RT	871	3784	0.23	0.50	1892	0.46	

CYCLE=120.0 LOST=26.0 SUM V/S CRIT= 0.62 TOTAL V/C= 0.79

FOR THE SOUTHBOUND PROTECTED/PERMISSIVE LEFT TURN LANE THE CAPACITY. V/S AND V/C
RATIOS HAVE ALL BEEN ADJUSTED TO REFLECT A CAPACITY FOR
[illegible] LEFT TURNS ON THE CHANGE INTERVAL AND 125 ON THE PERMISSIVE PHASE

LEVEL OF SERVICE WORKSHEET

DIR	LN GROUP	v/c	g/C	C	d1	c	d2	PF	Delay	LOS	Avg Q	95% Q
EB	LT	0.97	0.28	120.0	32.31	60	78.20	0.85	93.93	F	2.2	
EB	TH-RT	0.42	0.28	120.0	26.55	518	0.33	0.85	22.85	C	5.2	
WB	LT	0.76	0.28	120.0	29.85	282	7.92	0.85	32.03	D	5.1	
WB	TH-RT	1.12	0.28	120.0	34.25	476	73.38	0.85	91.65	F	19.9	
NB	LT	0.27	0.38	120.0	19.85	258	0.15	0.85	17.00	C	1.5	
NB	TH-RT	0.59	0.38	120.0	22.84	1414	0.48	0.85	19.82	C	16.5	
SB	LT	0.63	0.50	120.0	16.66	407	2.22	1.00	18.88	C	7.5	
SB	TH-RT	0.46	0.50	120.0	14.81	1892	0.13	0.85	12.70	B	13.8	

DIR	Delay	LOS
EB	[illegible]	D
WB	74.50	F
NB	19.60	C
SB	14.11	B

INTERSECTION DELAY = 32.65 INTERSECTION LOS=D

THE CYCLE LENGTH WITHIN THE BOUNDS OF 100 TO 120 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 90.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE 73.8 SECONDS
for chosen cycle length 90.0
suggested timing phase 1 is 32.9 secs green. 4.0 secs yellow + red clear
suggested timing phase 2 is 8.2 secs green. 0.0 secs yellow + red clear
suggested timing phase 3 is 22.9 secs green. 4.0 secs yellow + red clear
suggested timing phase 4 is 0.0 secs green. 18.0 secs yellow + red clear

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
JOSLIN: LONGWOOD/BROOKLINE
NO-BUILD 1993 PM PEAK HOUR
date:03-05-1991 time:15:41:24
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=BRLWNBPM GEOMETRICS=BRLWNBPM SIGNAL=BRLWNBPM
LOCATED IN CBD:N

VOLUME & GEOMETRICS

	VOLUMES			# OF LANES			LANE WIDTH			CROSS
DIR	LT	TH	RT	LT	TH	RT	LT	TH	RT	WALK
EB	67	198	67	1	1	0	10.0	11.0	0.0	40
WB	267	295	260	1	1	0	10.0	10.0	0.0	40
NB	78	660	108	1	2	0	11.0	12.0	0.0	60
SB	236	737	107	1	2	0	11.0	12.0	0.0	60

TRAFFIC & ROADWAY CONDITIONS

			ADJ	PARK			PEDESTRIANS			ARR
DIR	GRADE	%HV	Y/N	MOVES	BUSES	PHF	CROSS	BUT	MIN TIME	TYPE
EB	0.0%	1.6%	N	0	0	.890	10	Y	17.0	3
WB	1.0%	0.0%	N	0	0	.900	10	Y	17.0	3
NB	0.0%	2.9%	N	0	0	.890	35	Y	22.0	3
SB	0.0%	3.0%	N	0	0	.890	30	Y	22.0	3

PHASINGS

	EASTBOUND				WESTBOUND				NORTHBOUND				SOUTHBOUND				GREEN	Y+R	PRE/ACT
	l	t	r	p	l	t	r	p	l	t	r	p	l	t	r	p			
1	*	*	*		*	*	*										40.1	4	A
2													*	*	*		9.0	0	A
3									*	*	*		*	*	*		24.9	4	A
4				*				*				*				*	0.0	18	A

CYCLE= 100.0

VOLUME ADJUSTMENT WORKSHEET

PART 1 (MOVEMENT ADJUSTMENTS)

DIR	LTV	THV	RTV	PHF	LTFR	THFR	RTFR
EB	67	198	67	.890	75	222	75
WB	267	295	260	.900	297	328	289
NB	78	660	108	.890	88	742	121
SB	236	737	107	.890	265	828	120

PART 2 (LANE GROUP ADJUSTMENTS)

DIR	LN GROUP	FLOW	N	LU	v	Plt	Prt
EB	LT	75	1	1.00	75	1.00	0.00
EB	TH-RT	298	1	1.00	298	0.00	0.25
WB	LT	297	1	1.00	297	1.00	0.00
WB	TH-RT	617	1	1.00	617	0.00	0.47
NB	LT	88	1	1.00	88	1.00	0.00
NB	TH-RT	863	2	1.05	906	0.00	0.14
SB	LT	265	1	1.00	265	1.00	0.00
SB	TH-RT	948	2	1.05	996	0.00	0.13

PART 3 (OPPOSING VOLUME ADJUSTMENTS)

LEFT TURN	OPPOSING APPROACH									
BEING OPPOSED	VOLUMES			% OPPOSING LEFT TURN			# LANES			OPPOSING
	LT	TH	RT	LT	TH	RT	LT	TH	RT	VOLUME
EASTBOUND	297	328	289	100	100	100	1	1	0	617
WESTBOUND	75	222	75	100	100	100	1	1	0	298
NORTHBOUND	265	828	120	0	73	73	1	2	0	697
SOUTHBOUND	88	742	121	100	100	100	1	2	0	863

SATURATION FLOW ADJUSTMENT WORKSHEET

DIR	LN GROUP	IDEAL	N	Fwid	Fhv	Fgr	Fpark	Fbus	Farea	Frt	Flt	s
EB	LT	1950	1	0.933	0.992	1.000	1.000	1.000	1.000	1.000	0.196	354
EB	TH-RT	1950	1	0.967	0.992	1.000	1.000	1.000	1.000	0.962	1.000	1799
WB	LT	1950	1	0.933	1.000	0.995	1.000	1.000	1.000	1.000	0.531	961
WB	TH-RT	1950	1	0.933	1.000	0.995	1.000	1.000	1.000	0.930	1.000	1683
NB	LT	1950	1	0.967	0.986	1.000	1.000	1.000	1.000	1.000	0.269	499
NB	TH-RT	1950	2	1.000	0.986	1.000	1.000	1.000	1.000	0.979	1.000	3763
SB	LT	1950	1	0.967	0.985	1.000	1.000	1.000	1.000	1.000	0.950	1764
SB	TH-RT	1950	2	1.000	0.985	1.000	1.000	1.000	1.000	0.981	1.000	3769

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT

INPUT VARIABLES

DIR	C	G	N	Va	Vm	Vlt	Plt	No	Vo	Plto
EB	100	40	1	75	298	75	1.00	1	617	0.00
WB	100	40	1	297	617	297	1.00	1	298	0.00
NB	100	25	1	88	863	88	1.00	2	697	0.00

CALCULATIONS

DIR	Sop	Yo	Gu	Fs	Pl	Gq	Pt	Gf	El	Fm	Flt
EB	1800	0.343	8.860	0.490	1.000	31.224	0.000	0.000	2.298	0.196	0.196
WB	1800	0.165	28.208	0.689	1.000	11.876	0.000	0.000	1.633	0.531	0.531
NB	3600	0.194	6.899	0.440	1.000	18.016	0.000	0.000	2.559	0.269	0.269

CAPACITY ANALYSIS WORKSHEET

DIR	LN GROUP	v	s	v/s	g/C	c	v/c	CRITICAL
EB	LT	75	354	0.21	0.40	142	0.53	
EB	TH-RT	298	1799	0.17	0.40	721	0.41	
WB	LT	297	961	0.31	0.40	385	0.77	
WB	TH-RT	617	1683	0.37	0.40	675	0.91	*
NB	LT	88	499	0.18	0.25	124	0.70	
NB	TH-RT	906	3763	0.24	0.25	938	0.97	*
SB	LT	265	1764	0.10	0.09	240	1.10	*
SB	TH-RT	996	3769	0.26	0.34	1278	0.78	

CYCLE=100.0 LOST=26.0 SUM V/S CRIT= 0.71 TOTAL V/C= 0.95
FOR THE SOUTHBOUND PROTECTED/PERMISSIVE LEFT TURN LANE THE CAPACITY. V/S AND V/C
RATIOS HAVE ALL BEEN ADJUSTED TO REFLECT A CAPACITY FOR
74 LEFT TURNS ON THE CHANGE INTERVAL AND 7 ON THE PERMISSIVE PHASE

LEVEL OF SERVICE WORKSHEET

DIR	LN GROUP	v/c	g/C	C	d1	c	d2	PF	Delay	LOS	Avg Q	95% Q
EB	LT	0.53	0.40	100.0	17.33	142	2.92	0.85	17.21	C	1.3	
EB	TH-RT	0.41	0.40	100.0	16.35	721	0.23	0.85	14.09	B	5.0	
WB	LT	0.77	0.40	100.0	19.73	385	6.30	0.85	22.13	C	4.9	
WB	TH-RT	0.91	0.40	100.0	21.53	675	12.21	0.85	28.67	D	10.3	
NB	LT	0.70	0.25	100.0	25.98	124	10.84	0.85	31.30	D	1.8	
NB	TH-RT	0.97	0.25	100.0	28.22	938	16.01	0.85	37.60	D	18.0	
SB	LT	1.10	0.34	100.0	26.54	240	83.64	1.00	110.18	F	11.5	
SB	TH-RT	0.78	0.34	100.0	22.55	1278	2.21	0.85	21.05	C	17.4	

DIR	Delay	LOS
EB	14.72	B
WB	26.55	D
NB	37.04	D
SB	39.79	D

INTERSECTION DELAY = 32.96 INTERSECTION LOS=D

THE CYCLE LENGTH WITHIN THE BOUNDS OF 100 TO 100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE 101.5 SECONDS
for chosen cycle length 100.0
suggested timing phase 1 is 38.4 secs green, 4.0 secs yellow + red clear
suggested timing phase 2 is 10.4 secs green, 0.0 secs yellow + red clear
suggested timing phase 3 is 25.2 secs green, 4.0 secs yellow + red clear
suggested timing phase 4 is 0.0 secs green, 18.0 secs yellow + red clear

Joslin Diabetes Center

Dedicated to Diabetes Research, Treatment, Education, and Youth Programs

One Joslin Place
Boston, Massachusetts 02215

(617) 732-

September 24, 1991

Mr. Andrew McClurg
Boston Transportation Department
One City Hall Plaza/Room 271
Boston, MA 02201

Dear Andy:

Thank you for preparing the draft Transportation Access Plan Agreement. Based on our conversation of September 19, it appears we are settled on all the key provisions in Sections 2-6. Some terms, like section 9 on remedies and section 12 on liabilities, may need fine tuning. That can be worked out by the attorneys.

As an indication of the commitments we have made for the Access Plan Agreement, I will include this letter in the Final Project Impact Report which is being submitted to the BRA this week. Rather than try to summarize the contents of Sections 2-6, I have attached a copy of the language which we plan to incorporate in the final draft.

Thanks again for your efforts on this. I look forward to completing it.

Sincerely,

Connie

Constance L. Stubbs
Administrator

Enc.

Sections 2-6

TRANSPORTATION ACCESS PLAN AGREEMENT

BETWEEN

THE CITY OF BOSTON TRANSPORTATION DEPARTMENT

AND

JOSLIN DIABETES CENTER

Section 2. Traffic Mitigation

As a result of the Project's design, its location with respect to public transportation services and the Developer's commitment to traffic reduction strategies as described in this Agreement, the traffic impacts of the Project will be minimized. No new parking will be constructed in connection with the Project. To accommodate the new person-trips generated by the Project within the existing parking and roadway capacity, Developer will institute a program of parking management, demand reduction and commuter mobility measures, which together will constitute a Commuter Mobility Program. Such Commuter Mobility Program will be administered in cooperation with the efforts of the Longwood Medical Area Transportation Management Organization (LMA TMO), a joint venture of the institutions in the Longwood Medical Area (LMA), operated under the auspices of the Medical Area Services Corporation (MASCO).

Developer endorses the aims of the LMA TMO to accommodate all patients in and visitors to the LMA in reasonably priced off-street parking in close proximity to the patients/visitors' destinations; to encourage the use of transit and ridesharing by all employees in the LMA; to minimize traffic volumes in the Fenway/Kenmore/Mission Hill area by all practical means, including allocation and pricing of employee parking; and to improve traffic flow through the LMA by such measures as signage, striping, signalization, removal of on-street parking spaces, and other generally recognized engineering solutions.

Section 3. Parking

(a) Employee Parking Rates. At those parking facilities which Developer provides for Joslin employees, rates for employee parking will be structured so as to discourage employees from driving to work, and to make driving alone less attractive than ridesharing or taking public transportation. See Sections 4 and 5 *infra* which outline Developer's policies with respect to ridesharing and transit. Developer will adopt a parking policy which sets as a goal providing employee parking at unsubsidized rates. Examples of rates to be charged to Developer's

employee/staff for parking within 18 months of the signing of the agreement are: $100/month on-site, at the MASCO Garage on Longwood Avenue, and at the Pilgrim Road Garage owned by New England Deaconess Hospital; and $70 at off-site facilities. Developer is committed to a continuation of these policies to meet the goals described above.

(b) Patient/Visitor Parking Rates. The policy is to encourage staff over time to park off-site in order to make parking on-site available for staff and visitors.

(c) [Delete if this section duplicates provisions in the MASCO agreement.] Vanpool Parking Spaces. If, as a result of rideshare program efforts as described in Section 4, any vanpool/s are formed which are composed primarily of employees of the Developer, parking spaces will be provided up to a maximum of 3, at a discount of 50%.

(d) Parking Allocation.

(i) Developer will allot parking to its employees and staff in such a way as to discourage driving alone to work. For example, Joslin is testing a daily voucher system which allows staff with parking privileges to use alternate transportation without losing the right to park on-site.

(ii) If at some future time Joslin acquires use of facilities throughout the LMA, in assigning parking spaces to employees, it will through policy and procedure encourage and facilitate the use of parking spaces on a given side of the LMA by the employees whose origin is on that side of LMA.

(e) LMA Parking Committee. Developer will take an active role in the LMA parking committee, with the aim of acting collectively in setting parking policies to achieve areawide transportation goals, through such measures as reduced parking subsidies and joint management of parking facilities.

Section 4. Ridesharing

(a) Developer will participate in carpool/vanpool matching programs provided by the LMA TMO, utilizing survey of Developer's employees and contractors and computer-based matching techniques.

(b) Developer will provide promotional materials to Developer's employees and contractors, and promote carpooling and vanpooling by the installation of a transportation information literature rack in a common area, articles in Developer's newsletter, and other appropriate means.

(c) Developer will support the development of the LMA TMO's carpool/vanpool matching and MetroBus transit services.

(d) Developer will work to encourage shared access through programs such as the voucher system described above.

Section 5. Transit

(a) Developer will provide an on-site location for transit pass sales.

(b) Developer will offer subsidy of the cost of MBTA transit passes for basic Bus and Subway services for employees and staff of Developer in the amount of 25%. Developer expects to continue such subsidy and to meet such goal, and will do so, unless in good faith, but only after due consultation with the BTD, Developer determines that continuation, or continuation at the same level, is unworkable because of fiscal, fiduciary, or regulatory considerations.

Section 6. Bicyclists

Developer will provide ample, protected and convenient bicycle parking. Shower facilities will be available to all employees and staff of Developer who commute to work by bicycle.

Environmental Protection Component C

A qualitative analysis of the potential wind impacts of the proposed project at the pedestrian level has been prepared by Vanasse, Hangen, Brustlin Inc. in cooperation with Mr. Frank Durgin of the M.I.T. wind tunnel and is presented on the following pages.

Wind

INTRODUCTION

A qualitative wind assessment of pedestrian-level winds was conducted for the proposed Joslin Research and Clinic Facility Expansion project. The focus of this assessment was to evaluate public and other areas of pedestrian use, including building entrances, sidewalks, and other areas adjacent to the project site, such as Joslin Park and the central courtyard. This assessment considered 1991 Existing conditions and 1993 Build conditions, when the project is anticipated to be complete.

The addition of the Research and Clinic Facility Expansion project to the existing Joslin Diabetes Center will have little effect on the winds in the vicinity of the project site. These effects primarily will occur within the central outdoor courtyard and at the street-level entrances to the courtyard. Presently, the two windiest entrances to the courtyard are from Joslin Place and Brookline Avenue. Under proposed 1993 Build conditions, these two entrances will become enclosed, no longer providing direct access to the courtyard. The winds in the open courtyard entrance from Pilgrim Road are expected to remain similar to Existing conditions, but the direction of the wind flow may be reversed. The existing clockwise flow in the courtyard will likely be significantly reduced or eliminated. Under northeast wind conditions, winds will flow between the existing elevator tower and the Longwood Gardens apartment building. These conditions may cause accelerated winds in the courtyard and at the new entrance to the Joslin Diabetes Center from the courtyard. It is recommended that a one-story wind break be placed in the gap between the elevator tower and the apartment building. The Melbourne and Boston Redevelopment Authority comfort criteria for acceptable wind levels are not exceeded under Existing conditions, nor are they projected to be exceeded with the construction of the Joslin Research and Clinic Facility Expansion project.

PROJECT AND AREA DESCRIPTION

Project Site

The Joslin Diabetes Center, located within Boston's Longwood Medical Area, occupies the majority of the block surrounded by Brookline Avenue, Joslin Place, Pilgrim Road, and Longwood Avenue (see Figure 1). Longwood Gardens, a U-shaped apartment building at the corner of Longwood Avenue and Pilgrim

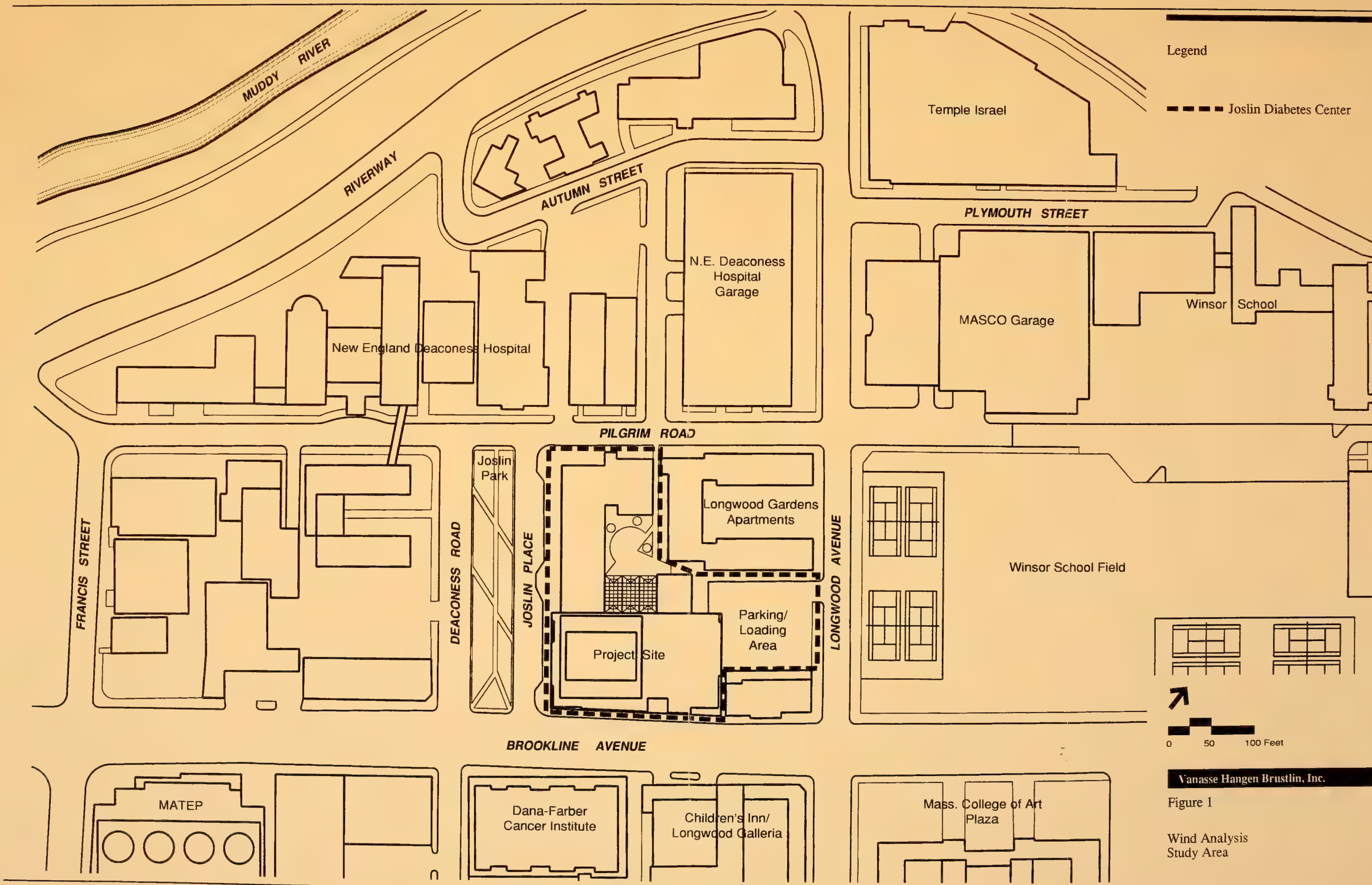


Figure 1

Wind Analysis Study Area

Road, occupies approximately one-quarter of the block on its north corner. A small commercial building lies northeast of the Joslin Diabetes Center at the corner of Brookline and Longwood Avenues. The Joslin parking lot and loading docks are located between the apartment building and the commercial building on Longwood Avenue. The existing Joslin Diabetes Center consists of two major four-floor building components: one oriented along Brookline Avenue and the other oriented along Joslin Place. Because there is an approximately ten-foot drop in ground level between Pilgrim Road and Brookline Avenue, there is a one-floor drop in the roof level along Joslin Place.

At the present time, the first floor of the Joslin Diabetes Center is occupied by four retail stores along Brookline Avenue. These retail uses are set back from the main front facade of the building. The Joslin Diabetes Center occupies the three floors above the retail uses, and all of the floors along Joslin Place and Pilgrim Road. In the center of the block is an outdoor courtyard, which is approximately level with Brookline Avenue. Separating the courtyard from the Longwood Avenue parking lot and the loading area is an elevator tower with three elevators and a stairway. The tower rises approximately 108 feet and is designed to serve an eight-floor building.

Under Existing conditions, there are three entrances to the central courtyard from the surrounding streets. The first is a "tunnel" entrance directly from Brookline Avenue, with retail uses on either side. The second entrance to the courtyard runs in a diagonal line from Joslin Place, down a ramp behind some of the retail uses. It, too, is an open "tunnel." The third entrance is a narrow open walkway which leads directly from Pilgrim Road and runs between the Joslin Diabetes Center and the Longwood Gardens apartments. This entrance is level with Pilgrim Road and leads along an elevated walkway atop a retaining wall to an entrance of the Joslin Diabetes Center or to a stairway down into the courtyard. This entrance is located one level above Brookline Avenue. The access from Pilgrim Road is probably the most used pedestrian way to the Joslin Diabetes Center, due to the location of the New England Deaconess Hospital parking garage directly across Pilgrim Road.

Area Description

The buildings immediately surrounding the site range from 20 to approximately 260 feet in height. To the north, across the intersection of Pilgrim Road and Longwood Avenue, the MASCO Parking Garage (85 to 100 feet) is under construction. To the northwest of the garage is Temple Israel, while to the northeast of the garage lies the Winsor School, both ranging from approximately 30 to 40 feet in height. The Winsor School playing fields and tennis courts are directly to the northeast of the project site, across Longwood Avenue.

From the east-northeast to the south-southwest direction are many 8 to 10 floor buildings within the Longwood Medical Area, which provide considerable shelter from winds from any of these directions. Located directly across Brookline Avenue from the project site is the Children's Inn/Longwood Galleria development, rising to a height of approximately 260 feet.

To the immediate southwest of the propose project, across Joslin Place, are Joslin Park and Deaconess Road. Beyond these are several one- and two-floor buildings along the northwest side of Brookline Avenue and several four- and

five-floor buildings along Pilgrim Road (part of the New England Deaconess Hospital campus). To the west of the project site, beyond the corner of Pilgrim Road and Joslin Place, are three New England Deaconess Hospital buildings which are estimated to be 155 to 135 feet high.

Finally, directly across Pilgrim Road from the Joslin Diabetes Center is a two-floor building, while beyond it, across Autumn Street, lies a 72-foot high apartment building facing the Riverway. Directly across Pilgrim Road from the Longwood Gardens apartments is the New England Deaconess Hospital Parking Garage. Beyond the garage, across Autumn Street, is an 84-foot building. Brookwood Terrace, located south of the New England Deaconess Hospital Parking Garage, runs from Pilgrim Road to Autumn Street, and lies directly opposite the third pedestrian entrance to the courtyard. Persons parking in the garage would use Brookwood Terrace and the third courtyard entrance to access the Joslin Diabetes Center.

WIND CLIMATE

Variation of Average Wind Velocity with Height

In general, the natural wind is unsteady (i.e., gusty) and its average velocity increases with height above the ground. Figure 2 depicts approximately how the average wind velocity varies with height for different types of surface features. For any building, the possibility exists that wind speeds at the top of the structure will be brought down to the ground level for certain wind directions. Because wind speeds increase with height, the taller the building, the stronger the winds that may occur at its base.

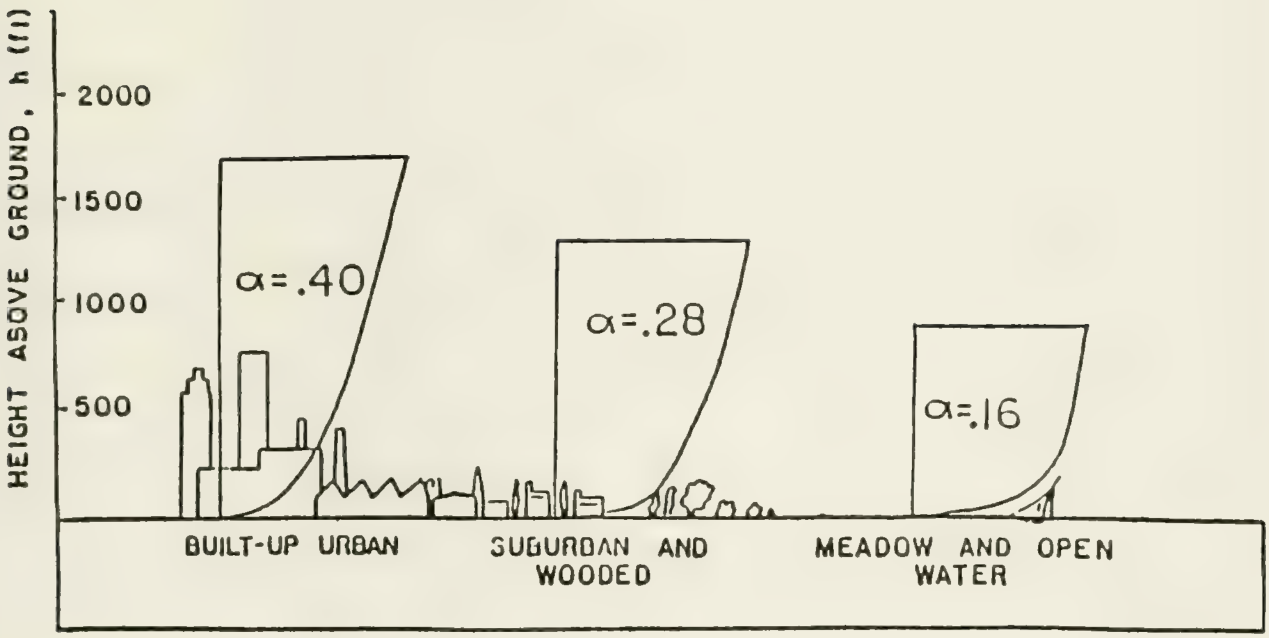
Monolithic buildings (i.e., those that do not change shape with height), if they are significantly taller than most of the surrounding buildings, almost invariably will be windy at their base. However, when there are a lot of buildings of similar height in an area, the buildings tend to shelter one another from the wind. Both of the above-mentioned effects are present for the Joslin Diabetes Center site.

Statistical Wind Description

The Joslin Diabetes Center site lies approximately 4.8 miles from Boston Logan International Airport and 3.0 miles from the downtown Financial District. Wind data from Logan Airport is typically used to define wind conditions for the Boston area.

Wind Direction

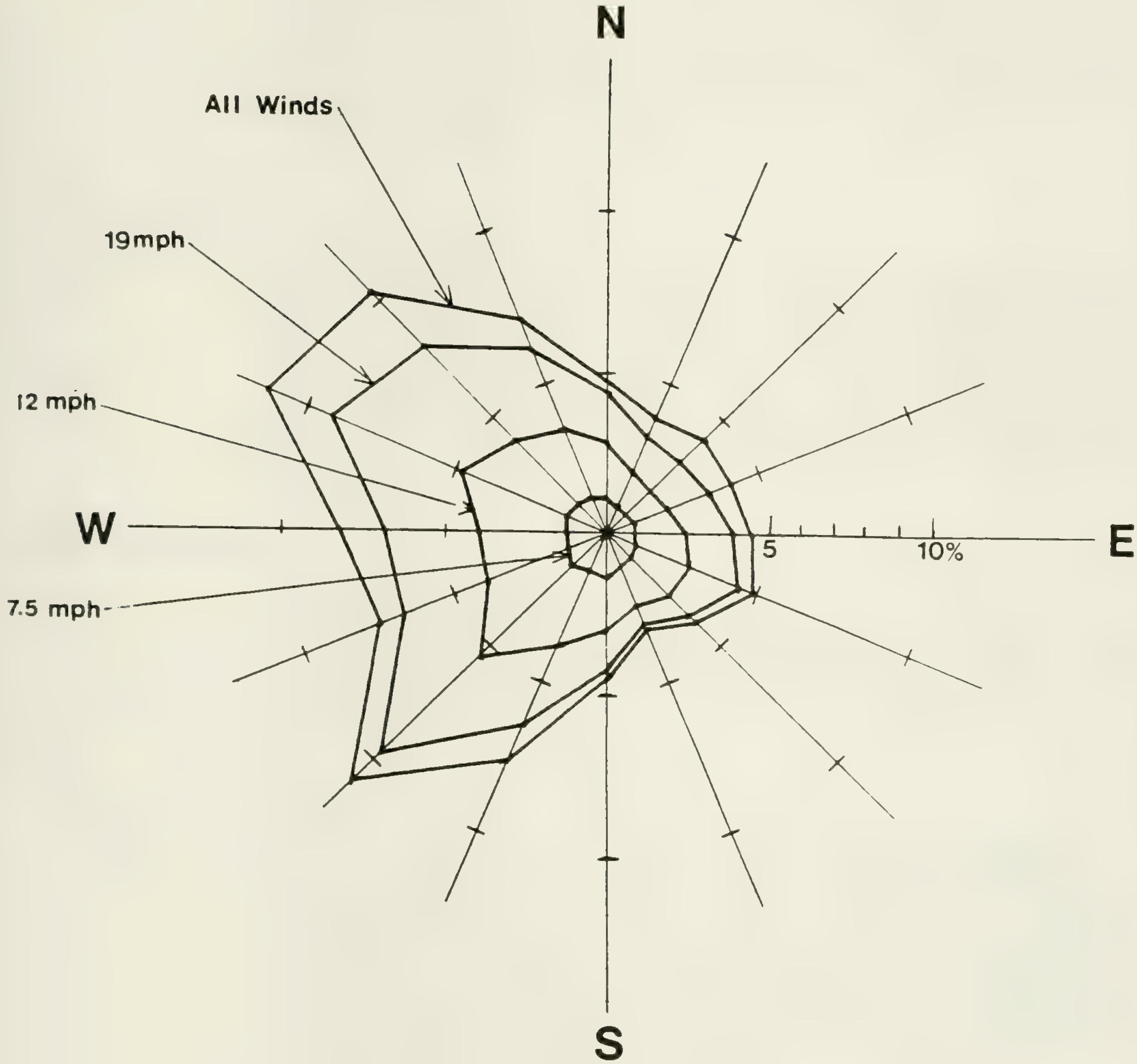
Figure 3 depicts a wind rose for the Boston Area, based on surface data from Logan Airport collected over a twenty-year period. The length of each of the lines radiating from the center of the figure is proportional to the time the wind comes from that direction. The length of each line from the origin point to the center of the line segments crossing the radial lines is proportional to the amount of time the winds coming from that direction are less than 7.5, 12.0, and 19 miles per hour (mph). The outermost ring represents all wind speeds, indicating the proportional amount of time the wind comes from a particular direction.



Vanasse Hangen Brustlin, Inc.

Variation of Wind Velocity with Height

Figure 2



Source: Surface Data Obtained from Logan Airport, 1945-1965

Vanasse Hangen Brustlin, Inc.

Boston Annual Wind Rose

Figure 3

As shown in Figure 3, winds in the Boston area come from the northwest quadrant one-third of the time, from the southwest quadrant another third of the time, and from the eastern half of the compass the remaining third of the time. Not reflected in the figure is the fact that northwest winds tend to occur more frequently in the winter and southwest winds more frequently in the summer, while spring and fall experience transitional winds. Strong easterly winds (from the northeast, east, and southeast) tend to occur during coastal storms when there is precipitation.

Wind Speed

The average wind speed at Logan Airport at 58 feet (the average height at which the data was collected) is 12.9 miles per hour (mph). At a pedestrian level (i.e., chest height, 4.5 feet) the average wind speed is approximately 8.0 mph. Figure 4 displays the average monthly wind speed at 58 feet at Logan Airport. Seasonally, the average wind speed is 14.2 mph in the winter, 13.9 mph in the spring, 11.2 mph in the summer, and 12.3 mph in the fall. However, the fastest hourly wind for a 100-hour return period is slightly faster in the spring than in the winter.

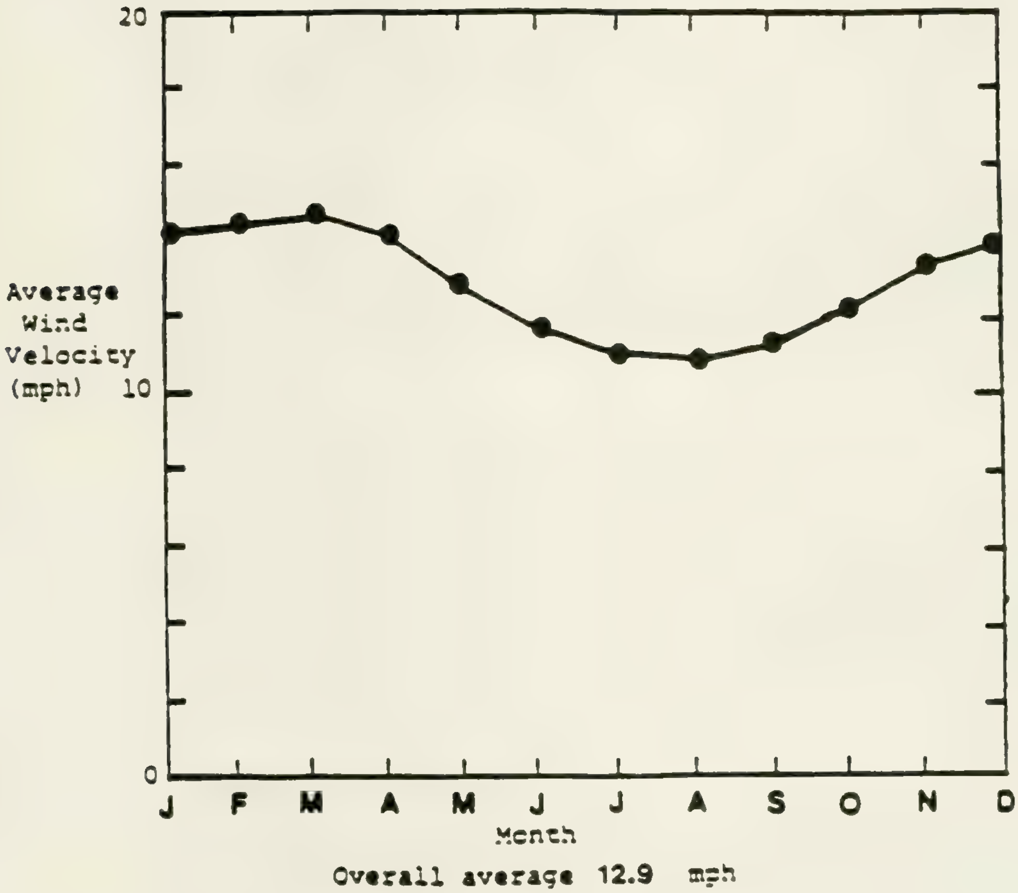
ANALYSIS CRITERIA

To evaluate pedestrian-level wind conditions, predicted wind speeds are compared to established comfort criteria. These criteria are subjective measures which attempt to qualitatively describe levels of human comfort. For the purpose of this analysis, the Melbourne and Boston Redevelopment Authority (BRA) criteria are presented.

Melbourne Criteria

In 1978, W.H. Melbourne conducted a literature review[1] to find a probablistic criteria for hourly average pedestrian-level wind speeds which would reflect safety considerations and the different types of human activities which could be accommodated within each criteria level. Melbourne established five categories of human comfort criteria: 1) "unacceptable and dangerous," 2) "uncomfortable for walking," 3) "acceptable for walking," 4) "acceptable for short periods of standing or sitting," and 5) "acceptable for long periods of standing and sitting." The results of this study are summarized in Table 1 for winds with a 100-hour return period (one percent probability) occurrence.

1/ Melbourne, W.H., "Criteria for Environmental Wind Conditions," Journal of Industrial Aerodynamics, Vol. 3, 1978, pp. 241-249.



Source: Data Obtained From
Logan Airport, 1945-1965

Vanasse Hangen Brustlin, Inc.

Average Wind Velocity at 58 Feet

Figure 4

Table 1 **MELBOURNE'S CRITERIA FOR 100-HOUR RETURN PERIOD PEDESTRIAN-LEVEL WINDS**

Category	Description	Average Wind Speed (mph)
1	Unacceptable and dangerous	27<Uav*
2	Uncomfortable for walking	19<Uav<27
3	Acceptable for walking	15<Uav<19
4	Stationary, short exposure	12<Uav<15
5	Stationary, long exposure	Uav<12

* Uav = Equivalent average

Melbourne's criteria are subjective and are expressed in probablistic form. They are defined in order that they may be used in the evaluation below to indicate approximately how windy a given location is presently and what the effect of a proposed building may be on that location. It is important to recognize that Melbourne's suggested categories are based on subjective experience, and not on measured wind tunnel tests.

Boston Redevelopment Authority Criteria

The BRA has adopted its own standard for assessing the relative wind comfort of pedestrians. This design guidance criterion states that an effective gust velocity (mean hourly wind speed plus 1.5 times the root-mean-square wind speed) exceeded one percent of the time should be less than or equal to 31 mph. This translates into a 100-hour return period equivalent average wind which falls into Melbourne Category 2, "uncomfortable for walking."

PEDESTRIAN WINDS AT THE PROJECT SITE

Under existing conditions, the Joslin Diabetes Center is surrounded on all sides--except on the northeast and southwest--by buildings of a similar height or higher. The pedestrian areas adjacent to and within the project site are typically not very windy. That is, all pedestrian areas have winds within Melbourne Categories 3, 4, or 5 (acceptable conditions), and certainly no pedestrian areas have winds that exceed the BRA effective gust guideline limit (100-hour return period wind speed exceeding 31 mph).

With the proposed expansion to the Joslin Diabetes Center, the resulting building complex on the site will not be significantly taller than most of the surrounding buildings. Although the proposed project will cause some significant--and beneficial--changes to the site, it is very unlikely that the project will cause any unacceptable pedestrian-level winds on-site or within the vicinity of the project.

The effects of the northwest winter winds, the southwest summer winds, and easterly storm winds on the Joslin Research and Clinic Facility Expansion project are discussed in the following sections. Wind effects are described for Existing conditions and 1993 Build conditions (see Figure 1).

For the most part, weather in New England is dominated by either large coastal storms or the Bermuda High. Typically when a coastal storm occurs, it rains for four to twelve hours and then it clears, followed by northwest winds for three or four days before the next weather system arrives. These storms, and the northwest winds which follow, mostly occur in the fall, winter, and spring. Northwest winds are particularly uncomfortable in the winter, when typically they occur on cold days. The Bermuda high is responsible for the southwest winds that occur in the summer.

Northwest (Winter) Winds

Existing Conditions

Northwest winds blow from the Riverway straight down Brookwood Terrace and across Pilgrim Road to the project site. The New England Deaconess Hospital Parking Garage provides protection from these winds for Longwood Gardens, due to the garage's taller height. For the more northerly of these winds, the garage also shelters the Joslin Diabetes Center facades along Pilgrim Road. However, for the remainder of the winter winds, the 50- to 60-foot project facade is not afforded much shelter by the two-story building across Pilgrim Road and the buildings across Autumn Street (approximately 500 feet away). As a result, northwest winds currently create a light breeze down Pilgrim Road toward Longwood Avenue and a slightly accelerated flow near the Joslin Diabetes Center at the corner of Pilgrim Road and Joslin Place.

Currently, the open entrance from Pilgrim Road to the courtyard is a little windy, with the wind blowing toward the courtyard under northwest wind conditions. The tunnel entrance from Joslin Place to the courtyard is also breezy; however, the tunnel courtyard entrance from Brookline Avenue is significantly more windy. This condition along Brookline Avenue is the result of a vortex created by the 260-foot high Children's Inn/Longwood Galleria project, causing winds to blow across Brookline Avenue from the Longwood Galleria toward the Joslin Diabetes Center. The vortex also results in relatively high pressure in this area of Brookline Avenue, thus causing fairly strong winds to blow up the entrance to the courtyard from Brookline Avenue. This same vortex phenomena will cause winds to blow up or down Brookline Avenue, depending on the exact direction of the wind. The more westerly northwest winter winds will cause southwest winds, while more northerly winds create northeast winds. This vortex effect might be expected to cause accelerated winds at the south corner of the intersection of Brookline Avenue and Deaconess Road.

Site observations conducted within the courtyard noted a clockwise (from above) swirl. Further, the plants within the courtyard show evidence of this swirl. Under northwest winds, this swirl is most likely caused by the Joslin Diabetes Center's 108-foot elevator tower.

Build Conditions

With the addition of the proposed expansion, the pedestrian-level winds on Pilgrim Road are projected to remain essentially unchanged from Existing conditions for northwest winds. Within the courtyard, however, the increase in the building height along Brookline Avenue to the height of the elevator tower is

expected to result in more air being trapped in the courtyard. This may result in winds blowing out toward Pilgrim Road. Windiness at the Joslin Place and Brookline Avenue entrances will likely be eliminated, because they will no longer be directly open to the courtyard. Winds blowing up and down Brookline Avenue may be slightly reduced, but not significantly.

It seems likely that the swirling winds in the courtyard will be reduced because of the increased symmetry in building height with respect to the courtyard. Further, even if significant swirling winds do remain, they will probably be reduced at ground level by the proposed two-story enclosed courtyard area at the southeast end of the courtyard.

With the completion of the MASCO Parking Garage by 1993 (now under construction at the north corner of Longwood Avenue and Pilgrim Road), the existing northwest wind flows down Pilgrim Road toward Longwood Avenue will likely be reversed. Wind flows may be accelerated next to the Longwood Gardens apartment building. These wind changes will not be affected nor caused by the Joslin expansion project.

Southwest (Summer) Winds

Existing Conditions

Southwest winds occur mostly in the summer and blow along Brookline Avenue from Joslin Place to Longwood Avenue and also blow directly at the Joslin Diabetes Center facade along Joslin Place. For southwest winds, the northwest portion of this facade is sheltered by the New England Deaconess Hospital building at the corner of Deaconess and Pilgrim Roads. Other, taller buildings across Pilgrim Road shelter the facade from the more westerly of these southwest winds.

Along Brookline Avenue southwest of the site, there are only one- and two-story buildings upwind of the Joslin Diabetes Center. Thus, the project's Joslin Place facade nearest to Brookline Avenue is quite exposed to southwest winds. As a result, accelerated winds might be expected at the south corner of the existing Joslin Diabetes Center on Brookline Avenue. Because the ground floor is recessed from the rest of the building facade at this corner, the effects of the southwest winds are probably minimized.

The exposure of the project's Joslin Place facade might be expected to cause a high pressure area to occur at the entrance to the courtyard from Joslin Place, creating winds blowing down the entrance to the courtyard. However, southwest winds also blow directly at the southwest facade of the elevator tower, which is twice as tall as the existing Joslin Place facade. Thus, the elevator tower is likely to create an even higher pressure area within the courtyard, causing southwest winds to blow out of the courtyard and also causing a strong rotational flow in the courtyard (clockwise from above). Some of the shrubbery in the courtyard shows evidence of this rotational flow. The flows out of the courtyard entrances on Brookline Avenue and Pilgrim Road are probably stronger than those exiting through the Joslin Place passageway.

Under existing conditions, southwest winds may also cause some windiness at the east corner of the Brookline Avenue and Deaconess Road intersection. Also, the presence of the Children's Inn/Longwood Galleria project (across Brookline Avenue from the project site) probably causes winds to be accelerated along Brookline Avenue between the two structures.

Build Conditions

With the completion of the Joslin Research and Clinic Facility Expansion project, the courtyard entrances from Brookline Avenue and Joslin Place will be closed off. The accelerated wind flow along Brookline Avenue between the project site and the Children's Inn/Longwood Galleria, as well as that at the south corner of the Joslin Diabetes Center, are projected to be somewhat increased due to the added height of the proposed project. Except for the most westerly of these southwest winds, the rotating flow within the courtyard is anticipated to be significantly reduced. Even when the swirling effect does occur, the presence of the enclosed courtyard area at the southeast end of the courtyard will likely reduce its impacts at ground level. Also, it appears likely that the flow out of the Pilgrim Road access point will be reduced. The proposed project is not expected to affect wind conditions at the corner of Deaconess Road and Brookline Avenue under southwest wind conditions.

Easterly (Storm) Winds

Existing Conditions

The most common storm winds are northeasterly. These winds blow directly down Brookline Avenue from Longwood Avenue toward Deaconess Road. Under these conditions, the Winsor School Field is directly upwind of the site and the Longwood Gardens building is upwind of the northwest portion of the project site, including most of the courtyard.

Under existing conditions the north corner of the Longwood Galleria and the Longwood Gardens buildings are probably windy. The effect of northeast winds primarily results in winds blowing through the gap between the Longwood Gardens and the project's elevator tower. Because this activity is present one-floor above the grade of the courtyard, its impacts are estimated to be minimal within the courtyard. Easterly winds blowing through this gap are also likely to create increased flows along the Pilgrim Road passageway.

Along Brookline Avenue, the juxtaposition of the Joslin Diabetes Center and the Children's Inn/Longwood Galleria causes accelerated flows along Brookline Avenue, as is the case under southwest wind conditions. Finally, while there is a tendency for northeast winds to create flows at all three of the open courtyard entrances, the flow is certainly in an outward direction at the Joslin Place entrance.

Build Conditions

Under 1993 Build conditions for easterly winds, the north corners of the Longwood Galleria and Longwood Gardens are projected to experience slightly stronger winds, but not to a noticeable degree. Completion of the MASCO

Parking Garage will likely have a greater impact at these locations than will the Joslin expansion project. The flow in Brookline Avenue also may be slightly stronger under 1993 Build conditions, while wind conditions at the Pilgrim Road courtyard entrance are not projected to change significantly.

The wind flow through the gap between the project's elevator tower and the Longwood Gardens is projected to become significantly stronger with the construction of the proposed project, due to the increased massing of the Joslin Diabetes Center. As a result, the building entrance within the courtyard and the courtyard itself (which will be raised one level) will experience greater winds than under Existing conditions. The placement of a one-story wind break in the gap would eliminate this problem.

The Joslin Diabetes Center will work with its architect and with its wind consultant to prepare a conceptual design for the proposed wind screen. This design will be reviewed with the BRA staff and modified, as needed, as a result of their review. Once the design is approved, it will be incorporated into the appropriate design package for the Research and Clinic Facility Expansion project.

SUMMARY

The addition of the Joslin Research and Clinic Facility Expansion project to the existing Joslin Diabetes Center is projected to have little effect on the winds in the vicinity of the project site. It is estimated that the winds in all of these areas are probably within Melbourne's Category 4 (stationary, short exposure) and are well within the BRA comfort criteria level. Under future 1993 Build conditions, winds are projected to remain within these levels.

The primary effects of the proposed expansion will occur within the project's courtyard and the entrances to it. It is estimated that Melbourne Category 3 (acceptable for walking) and Category 4 winds presently occur in the Joslin Place and Brookline Avenue entrances, making them marginally acceptable. Under future conditions, both of these entrances will become enclosed. The winds in the open courtyard entrance from Pilgrim Road (estimated to be Category 4 or Category 5 (stationary, long exposure)) will remain similar to existing conditions, however, the directional flows may be reversed much of the time.

The swirling flow within the courtyard will likely be much reduced or eliminated with the construction of the proposed project. Under northeast wind conditions, projected increases in wind will occur in the courtyard and at the project entrance from the courtyard, due to accelerated flows between the elevator tower and the Longwood Gardens apartment building. It is recommended that a one-story wind break be placed in this gap to reduce winds.

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SUMMARY

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The swirling flow within the courtyard will likely be much reduced or eliminated with the construction of the proposed project. Under northeast wind conditions, projected increases in wind will occur in the courtyard and at the project entrance from the courtyard, due to accelerated flows between the elevator tower and the Longwood Gardens apartment building. It is recommended that a one-story wind break be placed in this gap to reduce winds.

A shadow analysis of both the existing conditions and proposed new construction is presented on the following pages. This analysis has been prepared by Vanasse, Hangen, Brustlin, Inc. and includes studies at 9:00 a.m., 12:00 noon, and 3:00 p.m. for the Vernal Equinox, Summer Solstice, Autumnal Equinox, and Winter Solstice.

Shadow

INTRODUCTION

A series of computer-generated shadow analyses have been conducted for the Joslin Research and Clinic Facility Expansion project to predict and evaluate project-generated shadows. The project entails the addition of three floors plus a mechanical penthouse to an existing four-floor building along Brookline Avenue. The analyses focus on shadow effects on: the site and its internal courtyard; area sidewalks; major pedestrian areas, including Joslin Park and the Massachusetts College of Art plaza; and the private playing field of the Winsor School. Seasonal studies were conducted for the vernal equinox (March 21), summer solstice (June 21), autumnal equinox (September 21), and winter solstice (December 21) for morning, midday, and afternoon shadow effects. As directed in the Boston Redevelopment Authority (BRA) Scope, the shadow analyses identify the incremental impact of the proposed project on the study area through a determination of net new shadows by comparison to existing shadows from the site and surrounding buildings.

The proposed Joslin Research and Clinic Facility Expansion project is not anticipated to generate significant new shadow impacts on public open spaces, including parks, sidewalks, and roadways within the study area. These impacts are projected to be minimal due to:

- The location, configuration, and massing of the existing Joslin Diabetes Center

- The design of the proposed project as a three-floor addition to an existing structure

- The existing shadow effects on public open spaces caused by other structures within the study area

Joslin Park will experience small incremental shading effects during summer and fall mornings. The Joslin Diabetes Clinic courtyard (at its proposed raised elevation) will have negligible net new shadows during summer mornings and spring midday periods. The Winsor School field will be shaded only in winter afternoons by the proposed project. Because project shadows will not noticeably extend into Brookline Avenue, the plaza area in front of the Massachusetts College of Art building and the pedestrian area in front of the Beth Israel Hospital will not be impacted.

Study Area

For the purposes of this analysis, Brookline Avenue will be referred to as running in a north/south direction. The study area for this shadow analysis is generally bounded by the Riverway to the west, Short Street to the north, Brookline Avenue and Binney Street to the east, and Francis Street to the south (see Figure 1). All structures within these boundaries were computer modeled in three dimensions in order to calculate existing and net new shadows in the vicinity of the project site.

Consideration is given to the sidewalks surrounding the site, as well as existing public and private open spaces in the study area. These areas are shown in Figure 2 and are described below:

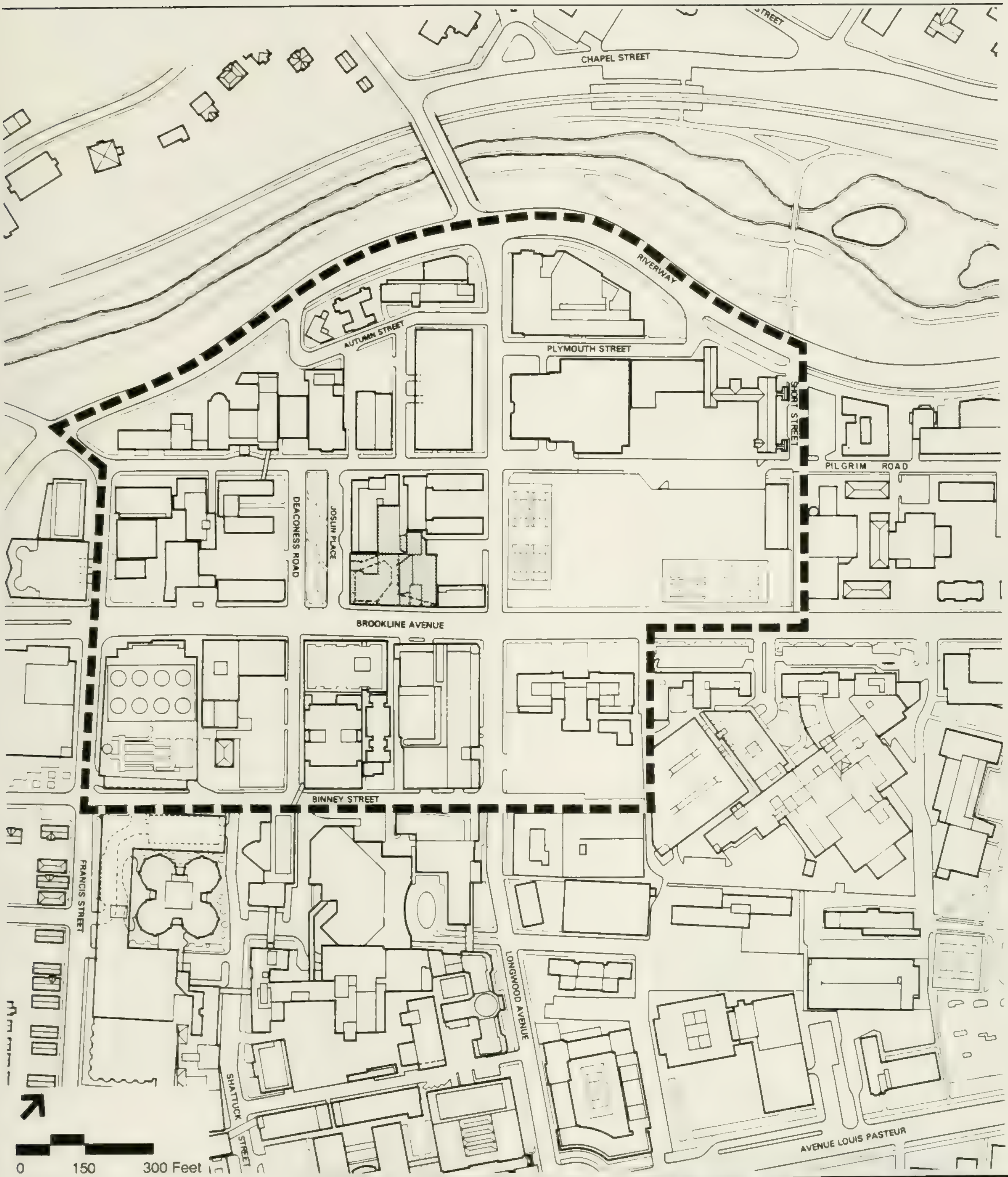
- Joslin Park, a landscaped pedestrian walking/sitting area between the two one-way roads (Joslin Place and Deaconess Road) at the entrance to the Joslin Diabetes Center.
- Joslin Diabetes Center courtyard (central to the facility) that will be raised to the level of Pilgrim Road as a result of this project
- Landscaped plaza area west of the Brookline Avenue entrance of the Massachusetts College of Art
- Parking and pedestrian areas west of the Beth Israel Hospital
- Private playing field of the Winsor School, including tennis courts along Longwood and Brookline Avenues

Shadow Analyses

Shadow lengths and locations are dependent upon structure height and massing, building location, and the location of nearby structures, as well as topography, time of day, and the sun's position relative to the earth. For purposes of this study, shadows were cast in the ground plane. The sun's position is established by calculating various angles which are dependent upon the time of analysis and the earth's orbit, as discussed below.

Sun Angles

As the earth orbits in an elliptical pattern around the sun, the angle of its rotation varies over the year, causing the sun to appear at different positions in the skydome. In the Northern Hemisphere, the sun is at its highest point in the sky during the summer months, peaking on the summer solstice (June 21). The sun moves southward (toward the equator) relative to the northern hemisphere as fall approaches, and is nearly even with the equator during the autumnal equinox (September 21). During the winter, the sun dips below (south of) the equator, reaching its lowest point on the winter solstice (December 21), at which point it begins to move back toward the equator, reaching the equator again on the vernal equinox (March 21). The sun's position relative to the equator is the same for both the autumnal equinox and the vernal equinox.



Vanasse Hangen Brustlin, Inc.

Shadow Study Area

Figure 1

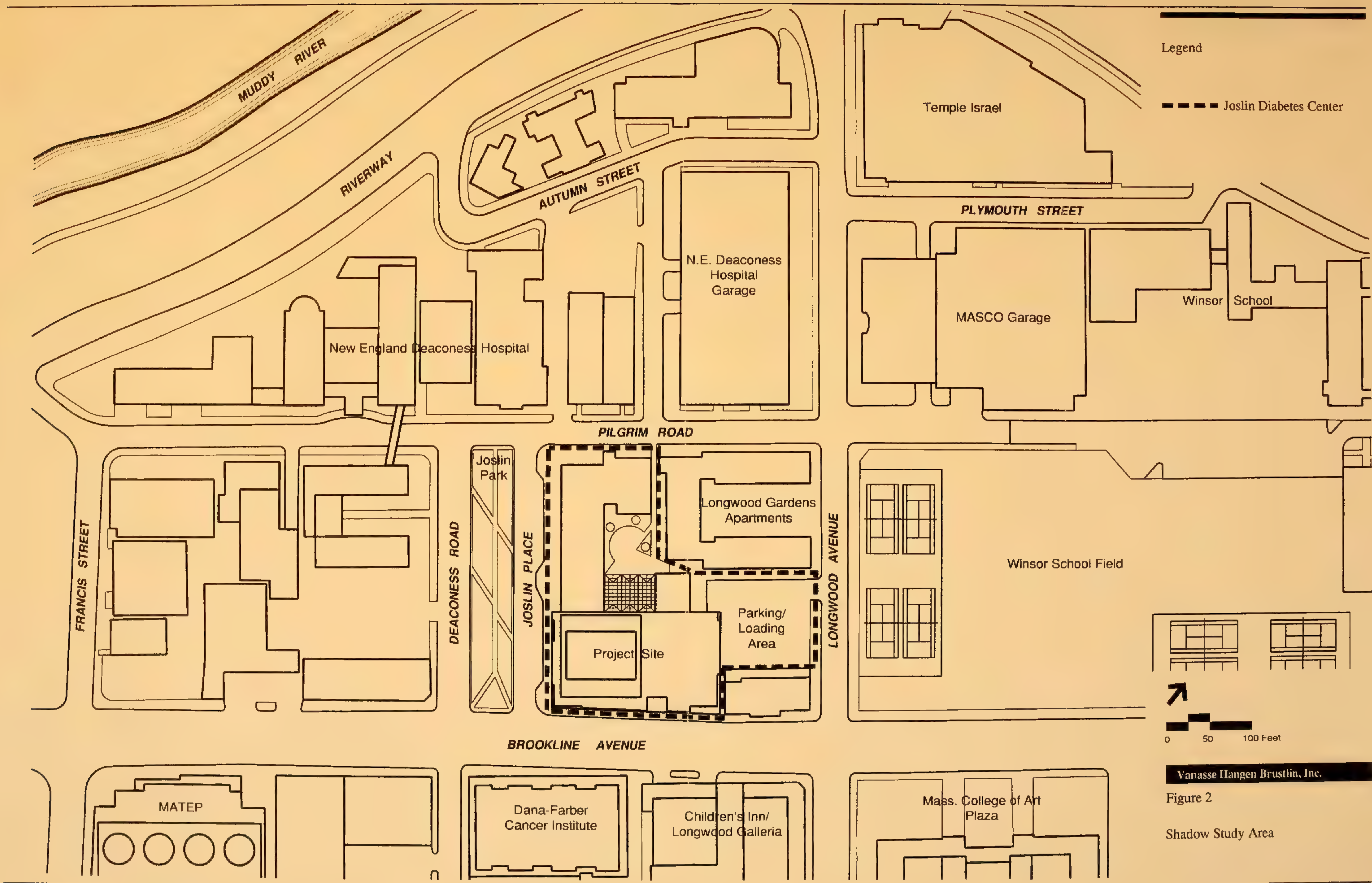


Figure 2

Shadow Study Area

Because the sun's position as it appears in the northern hemisphere is highest at the summer solstice, shadows are shortest at this time. March and September shadows represent average shadow conditions, while shadows are longest at the winter solstice, when the sun is at its lowest position in the sky.

The sun's position in the sky relative to any particular location on earth is designated by two angles:

- "Solar altitude" is the angle measured from the horizon up to the sun (see Figure 3). When the sun is on the horizon, this angle equals 0 degrees, and when the sun reaches its zenith, this angle equals 90 degrees.

- The angle which measures the distance between north and the sun's projection on the horizon is called the "solar azimuth" and is measured clockwise from the north direction. This angle equals 0 degrees at north, 90 degrees at east, 180 degrees at south, 270 degrees at west, and 360 degrees at north to complete the full circle. Solar azimuth is measured from "true" or "geographic" north, versus magnetic north (the direction toward which a compass points). The difference between true north and magnetic north varies annually and can be substantial (greater than 20 degrees).

Time

Time is an important variable in calculating the sun's position. In conducting accurate shadow analyses, it is necessary to calculate solar time (versus clock time). For this project, several factors associated with time were considered, as discussed below.

Clock Time. Clock time is the standard measurement used to denote time. A total of twenty-four standard time zones have been established, representing the 24 hours required for the earth to complete a rotation. Because the earth rotates 15 degrees every hour, time zones encompass approximately 15 degrees of longitude, with each time zone associated with a central longitude. The longitudinal lines used to establish time zones are referred to as meridians, with the Greenwich, England meridian used as the prime basis of standard time throughout the world (i.e., the Greenwich meridian represents 0 degrees longitude).

- The Eastern Standard Time Zone is associated with the central longitude of 75 degrees, and it includes the eastern portion of the United States. This time zone lies five meridians (each of 15 degree intervals) to the west of the Greenwich meridian (0 degrees longitude), representing a five-hour time difference between this zone and Greenwich, England.

- Daylight Savings Time (DST) is in effect in North America from the first Sunday in April to the last Sunday in October. Although initially instituted on a local basis during World War I in the industrial areas of the North to conserve fuel, it was nationally instituted after World War II to provide city dwellers with an additional hour of daylight for activities after work. In the spring, clocks are advanced ahead one hour to Daylight Savings Time. In the fall clocks are set back one hour, returning to Eastern Standard Time. Both the summer solstice and the autumnal equinox occur while Daylight

Savings Time is in effect. Although the earth is in a similar orbit during both the vernal equinox and the autumnal equinox, measurements of the sun's position vary by one hour because Daylight Savings Time is in effect for the autumnal equinox.

Solar Time. When calculating sun angles for shadow analyses purposes, it is necessary to use solar time, rather than clock time, to accurately calculate the sun's position at any given time. Solar time is derived by adjusting clock time for: (1) site distance from the local standard meridian; (2) Daylight Savings Time; and (3) seasonal changes in the earth's orbiting pattern, referred to as the "equation of time."

Clock time for standard time zones is associated with a central longitude, therefore, it is necessary to account for variation in the sun angles for sites which do not lie directly along the central longitude. The project site lies within the Eastern Standard time zone whose standard meridian is at 75 degrees longitude. The project site itself is located at a longitude of approximately 71 degrees. Solar time varies from clock time by approximately 4 minutes for every degree of longitude. Thus, for every degree of longitude a site lies to the east of the central longitude, 4 minutes are added to clock time to derive solar time, while for every degree to the west, 4 minutes are subtracted from clock time. Depending upon the location being studied, solar time can vary from clock time by 30 minutes or more.

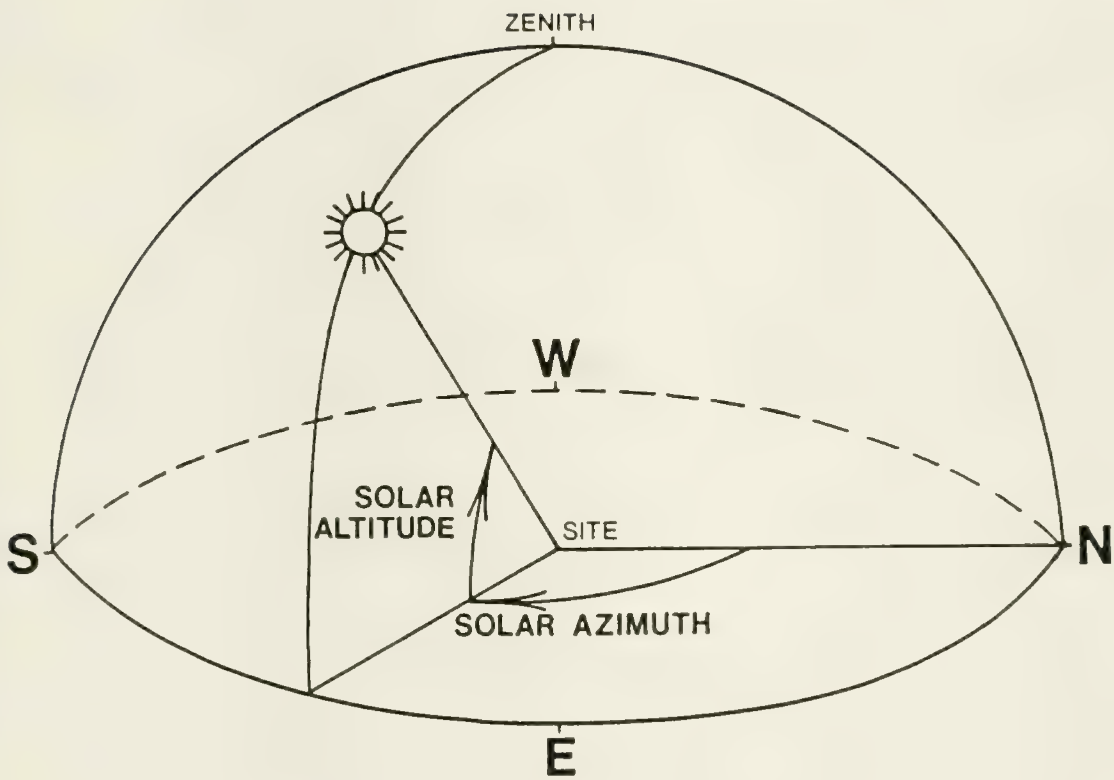
Equation of Time. As the earth orbits around the sun, seasonal variations occur in the geometry of their relative positions, affecting solar time. In order to accurately derive solar time, a corrective factor is applied. This factor is referred to as the "equation of time," as shown in Figure 4.

ANALYSIS CONDITIONS

A series of computer-generated shadow analyses have been conducted to compare and evaluate existing and proposed project shadows. These analyses are shown at the end of this chapter in Figures 5 through 16 for twelve analysis conditions. The figures show the combined shadow impacts for the existing and future conditions in order to clearly demonstrate the location of net new shadows. The darkly shaded areas represent net new shadows cast by the proposed project. The lighter shaded areas represent the shadows cast by buildings existing in 1990 and 1993 (including the existing Joslin Diabetes Center).

Existing Conditions

Under existing conditions, the Joslin Diabetes Center occupies the project site. First floor areas facing Brookline Avenue are devoted to retail uses: restaurant, convenience store, copy store, pharmacy/gift store, and bank. These retail uses are set 15 to 20 feet in from the sidewalk, under the overhang of the clinical spaces above. This overhang also includes a passageway to the existing Clinic entrance and landscaped courtyard.

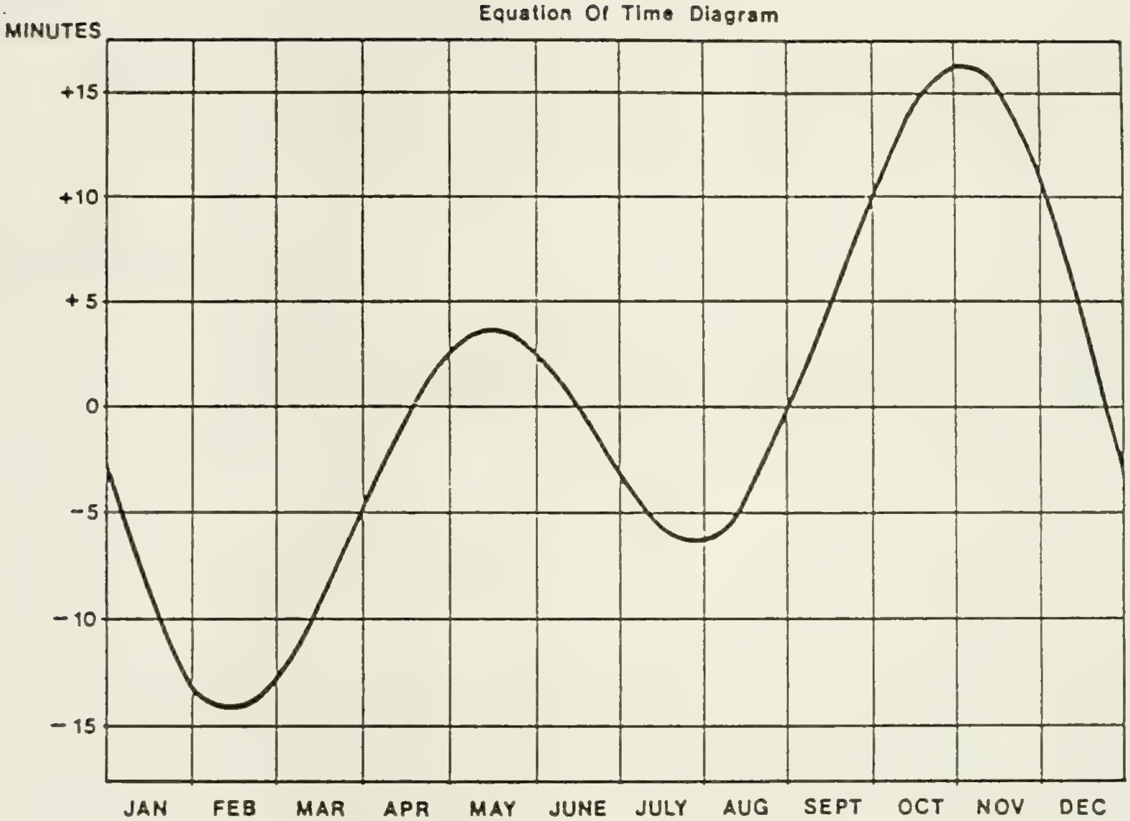


Source: *Sun Angles for Design*, Robert Bennett, Bala Cynwyd, PA, 1978.

Vanasse Hangen Brustlin, Inc.

Solar Angles

Figure 3



Source: *Sun Angles for Design*, Robert Bennett, Bala Cynwyd, PA, 1978.

Vanasse Hangen Brustlin, Inc.

Equation of Time

Figure 4

Major buildings or structures in the area that cast significant shadows in the study area include: the Longwood Gardens apartment building, the Children's Inn/Longwood Galleria, Children's Hospital, the Dana-Farber Cancer Institute, the MATEP energy facility, Brigham and Women's Hospital, and the New England Deaconess Hospital and its parking garage at the corner of Longwood Avenue and Pilgrim Road. The size of these structures and their location in relationship to the Joslin Diabetes Center site establish much of the existing shadow environment for the area.

1993 Build Conditions

Under 1993 Build conditions, the Joslin Research and Clinic Facility Expansion is scheduled to be complete. In addition, it is assumed for this analysis that the MASCO garage presently under construction at the corner of Longwood Avenue and Plymouth Street will be complete by 1993.

PROBABLE PROJECT IMPACTS

Project-related shadow impacts are discussed for the Build condition (1993) in relation to the net new shadows created as part of the Joslin Research and Clinic Facility Expansion project. Impacts of the Build condition are graphically identified in the shadow analyses Figures (Figures 5 through 16) at the end of this section.

March 21, Vernal Equinox (EST)

9:00 AM

Existing shadows from the project site and apartment building shade the courtyard and the sidewalks adjacent to Joslin Place. Shadows are cast on the eastern end of Joslin Park by the Dana-Farber Cancer Institute. The west wing of the existing project structure casts shadows across Pilgrim Road. Under 1993 Build conditions, the proposed expansion project will cast new shadow along Joslin Place; however, this shadow will not extend into Joslin Park.

Noon

Existing project shadows shade portions of the central courtyard, the Joslin parking lot, Pilgrim Road, and its eastern sidewalk. With the proposed expansion, incremental shadows will accrue in the courtyard and parking lot; however, sunlit areas will still remain.

3:00 PM

During fall afternoons, the courtyard lies entirely within shadow, while the majority of the Joslin parking lot and Brookline Avenue sidewalk adjacent to the project site are shaded. Portions of Longwood Avenue are also in shadow created by existing structures on the southern side of the roadway. With the

expansion of the project site, additional shadows will be generated within the parking lot, Longwood Avenue and its southern sidewalk. Negligible shadows will also accrue along the west edge of Brookline Avenue south of Longwood Avenue.

June 21, Summer Solstice (EDT)

9:00 AM

Existing shaded areas during summer mornings extend from the project site and the Children's Inn/Longwood Galleria into Joslin Place and Joslin Park. The courtyard is almost entirely shaded, while Pilgrim Road also experiences significant shadows. The proposed project will add net new shade to Joslin Park, and will create a very minor shadow within the courtyard.

Noon

The Joslin Diabetes Center generates very few shaded areas during summer midday periods, shadowing small areas of the adjacent sidewalk along Joslin Place and the Joslin parking lot. The proposed glass canopy within the courtyard will enclose the major area of existing and projected new shadows in the courtyard. Additional new shade will occur in the loading dock area of the Joslin parking lot.

3:00 PM

Currently, site-generated shade during summer afternoons occurs within the courtyard, the Joslin parking lot, and the western sidewalk along Brookline Avenue. With the proposed project, small areas of incremental shade will be generated on Brookline Avenue and within the parking lot.

September 21, Autumnal Equinox (EDT)

9:00 AM

During fall mornings, the majority of Joslin Park, Joslin Place, Pilgrim Road, Brookline Avenue, and the courtyard lie in shadow from existing structures. With the proposed Joslin Expansion project, net new shade will be created in Joslin Park and within a small area of the central courtyard.

Noon

Existing fall midday shadows are cast within the southern and eastern edges of the courtyard, Pilgrim Road, Brookline Avenue, and the Joslin parking lot, with a negligible area of shade on the adjacent sidewalk along Joslin Place. Under 1993 proposed conditions, incremental new shadows will be generated within the parking lot and the courtyard, while some sunlit areas will remain.

3:00 PM

During existing fall afternoons, shadows from the Joslin Diabetes Center cover portions of the sidewalk along Pilgrim Road, and the majority of the courtyard and the Joslin parking lot. With the proposed three-floor expansion, the project will generate some net new shadow within the parking lot and the sidewalk abutting Longwood Avenue.

December 21, Winter Solstice (EST)

9:00 AM

Presently, existing winter morning shadows within the study area cover the majority of Brookline Avenue, Pilgrim Road, Joslin Place, and Joslin Park. In addition, the Joslin parking lot and and the courtyard lie entirely within shadow, while the Massachusetts College of Art building casts shadow on a portion of the Winsor School field. Under 1993 Build conditions, the only net new shadow from the project will consist of a sliver of shaded area within Pilgrim Road and the New England Deaconess Hospital campus.

Noon

During winter midday periods, Pilgrim Road, Brookline Avenue, and portions of Longwood Avenue lie in shadow in the vicinity of the project site. The courtyard is entirely shaded, as is the majority of the Joslin parking lot. Additionally, the Children's Inn/Longwood Galleria project casts a shadow across the Winsor School field and tennis courts. Under proposed conditions, net new project shadow will be cast within a portion of the Joslin parking lot, Longwood Avenue, and its southern sidewalk. New shadow will not extend across the width of Longwood Avenue.

3:00 PM

The longest shadows of the year typically occur during winter afternoon periods. Under existing conditions, the courtyard and the Joslin parking lot are entirely shaded, as is Longwood Avenue in the vicinity of the project site. Portions of Deaconess Road, Joslin Park, Joslin Place, Pilgrim Road, the Winsor School field, and Brookline Avenue lie in shadow. With the proposed expansion project, net new shadow will be cast within the field of the Winsor School, only.

MITIGATION MEASURES

Overall, the minimal shadow effects of the project are the result of its small increase in height and bulk, its siting relative to public open spaces within the Longwood Medical Area, and the proximity of tall buildings near the project site. In order to minimize the shadows associated with the proposed project, the mechanical penthouse is located as far south as possible and is designed to step back from the usable project area beneath it. At a proposed height of seven floors (108 feet), the completed Joslin Research and Clinic Facility Expansion project will be only of moderate height and bulk when compared to other nearby institutional buildings within the Longwood Medical Area.

CONCLUSION

Shadow impacts of the proposed Joslin Research and Clinic Facility Expansion project are projected to be minimal. The new central courtyard will experience some incremental shading during summer and fall mornings and during spring and fall midday periods. Although shadows within Deaconess Road will not be affected by the proposed project, portions of Joslin Park and/or Joslin Place and its adjacent sidewalks will be shaded during spring, summer, and fall mornings. Pilgrim Road will experience negligible shadows during winter mornings, while very small areas of shade will be generated in Brookline Avenue during spring and summer afternoons. Longwood Avenue will be partially shade by the project during spring afternoons and winter midday periods. The Winsor School field will only be affected by the project in winter afternoons, when the playing field and tennis courts are not in scheduled use. No project-related shadows will extend to the Massachusetts College of Art plaza or to the pedestrian areas in front of Beth Israel Hospital.

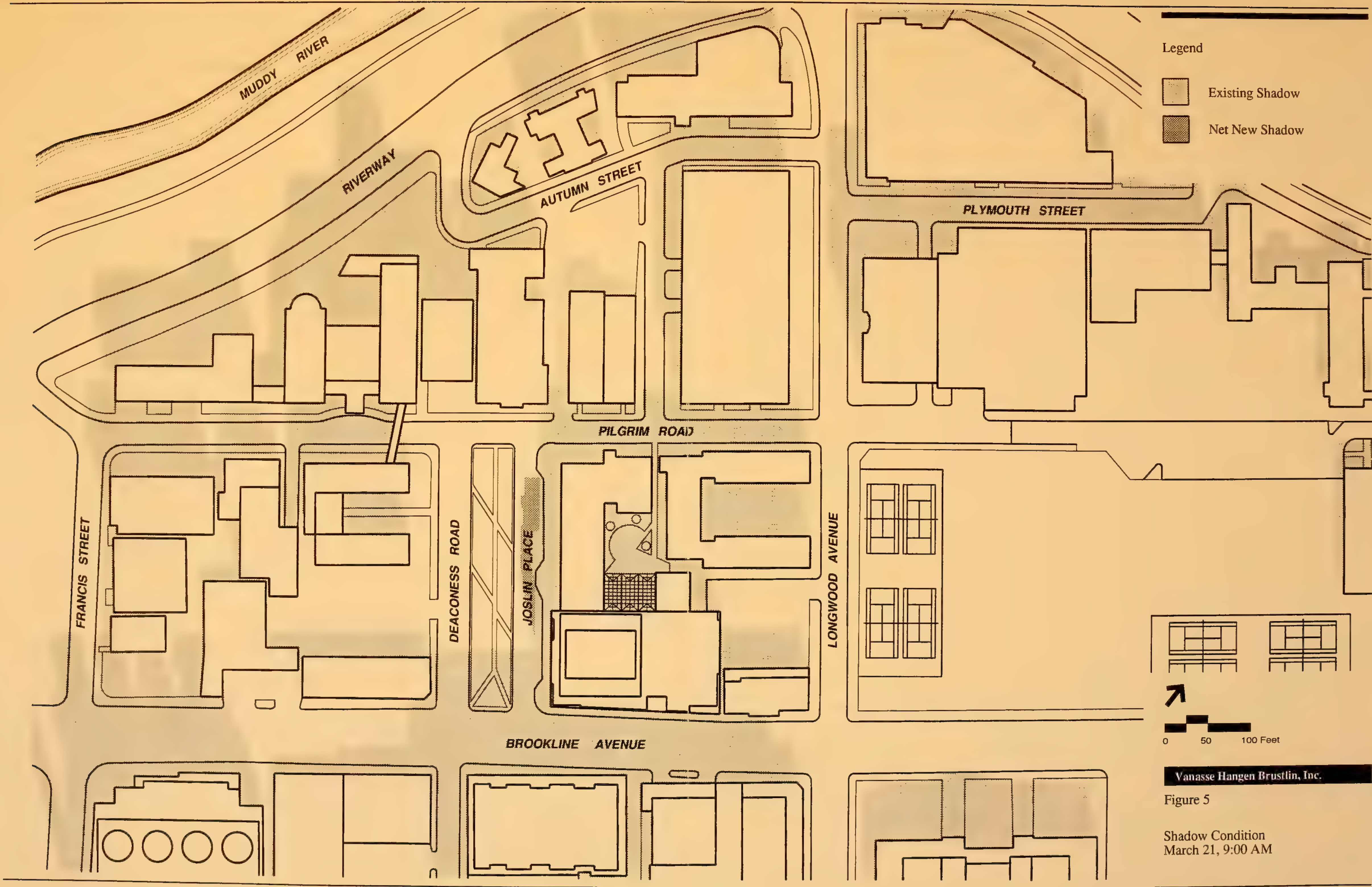


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Figure 5

Shadow Condition
March 21, 9:00 AM

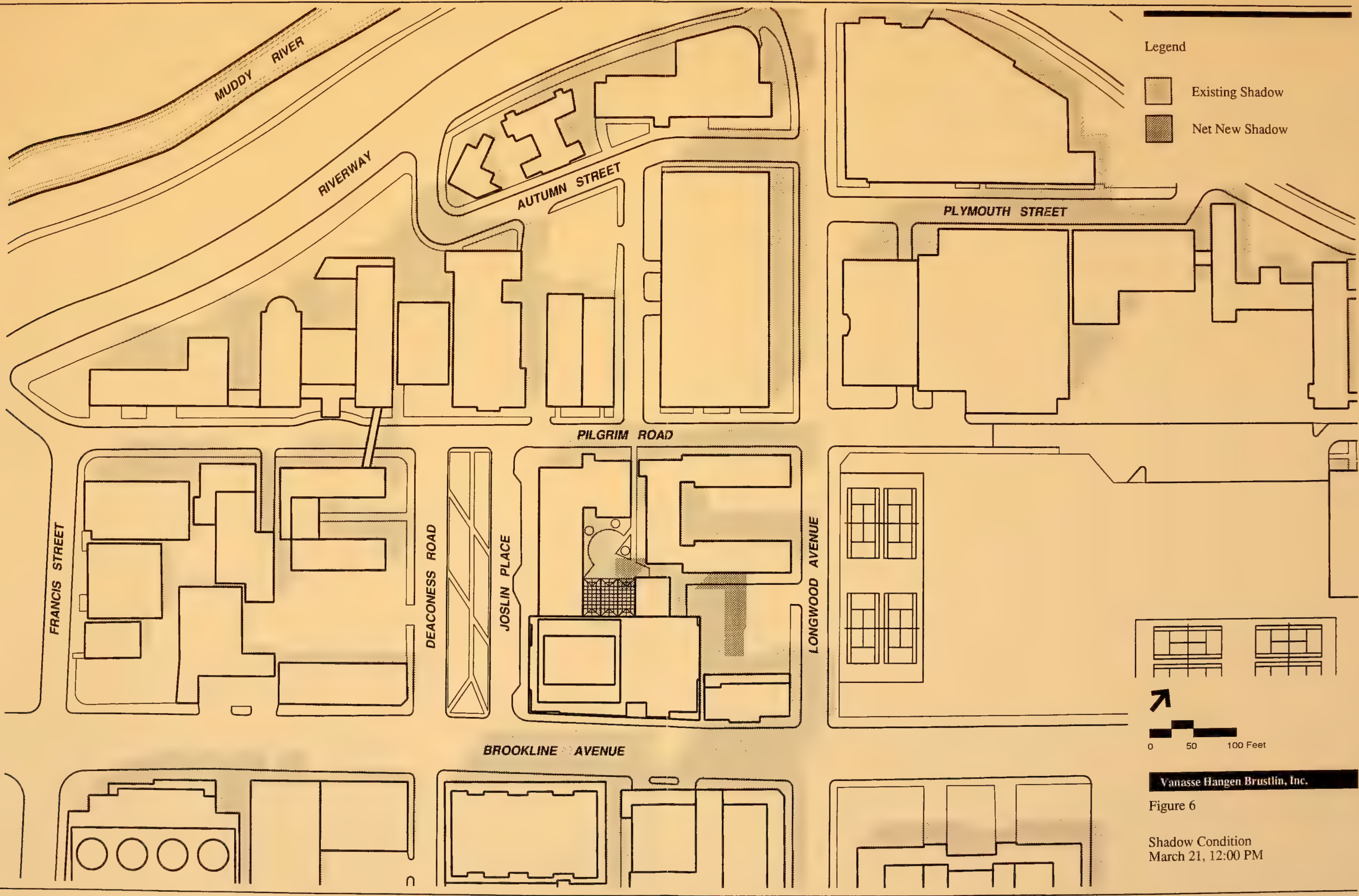

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Figure 6

Shadow Condition
March 21, 12:00 PM

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Figure 7

Shadow Condition
March 21, 3:00 PM

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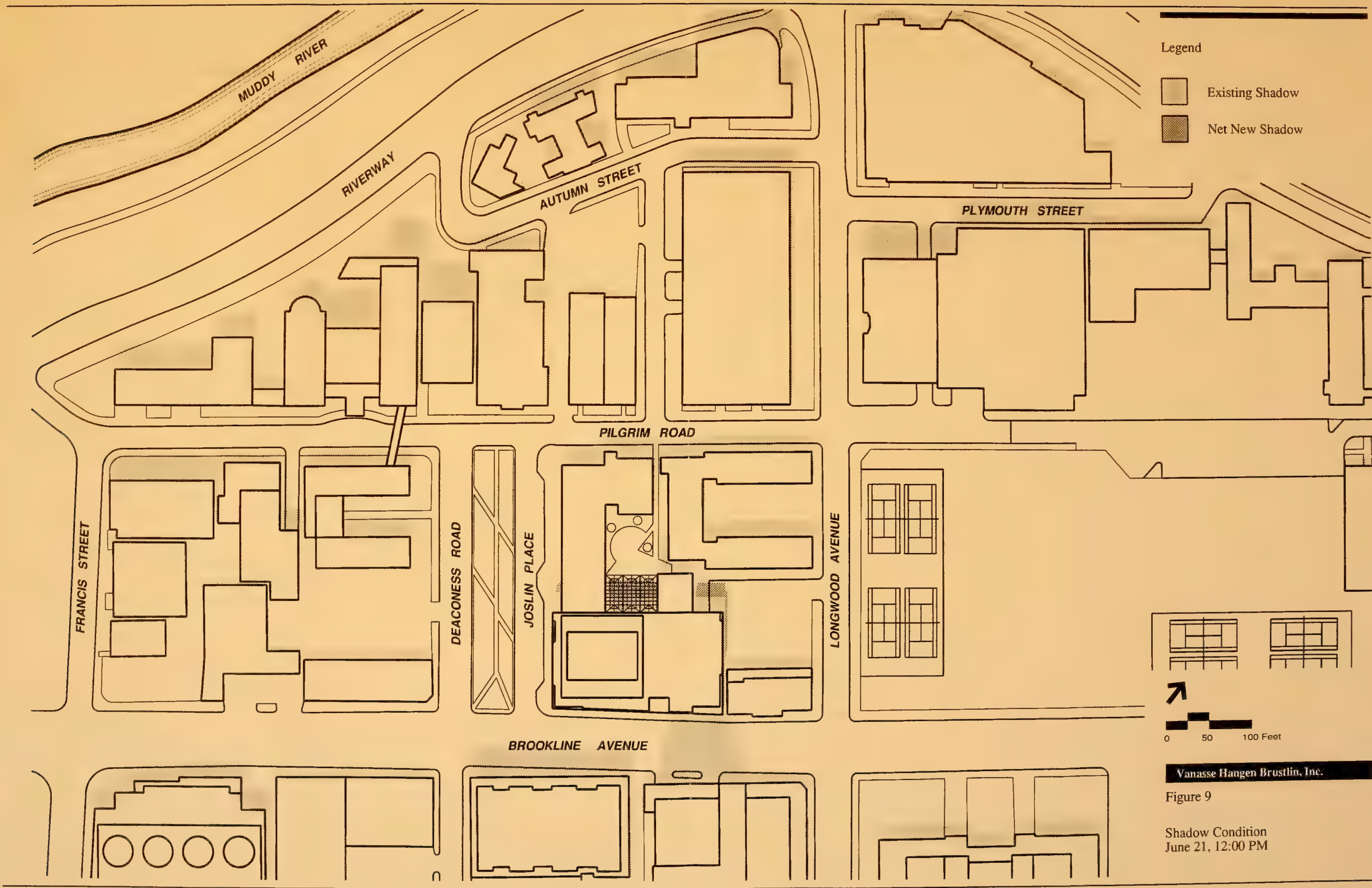
Figure 8

Shadow Condition
June 21, 9:00 AM



Vanasse Hangen Brustlin, Inc.

Figure 9

Shadow Condition
June 21, 12:00 PM

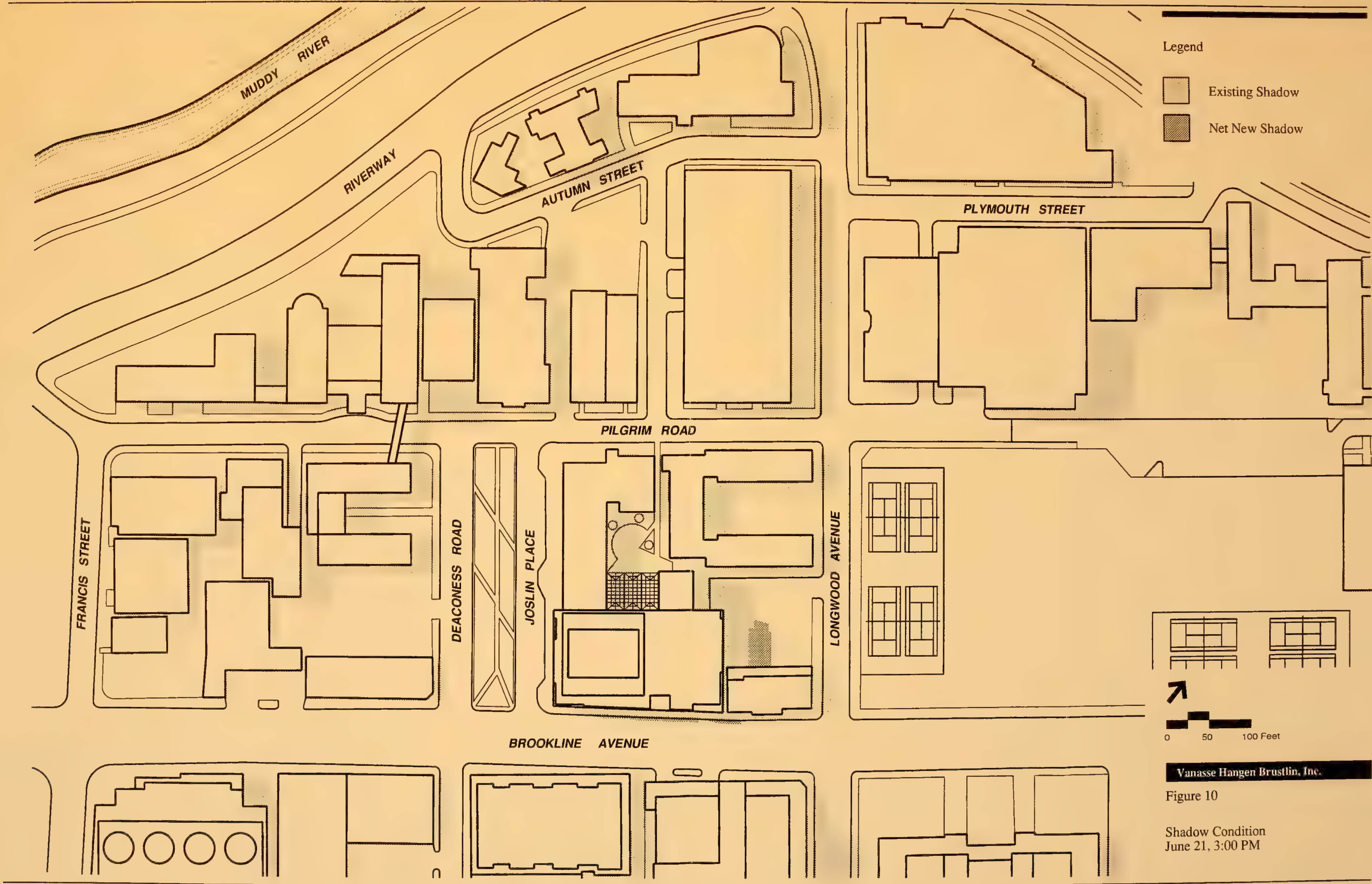


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Figure 10

Shadow Condition
June 21, 3:00 PM

Figure 11

Shadow Condition
September 21, 9:00 AM

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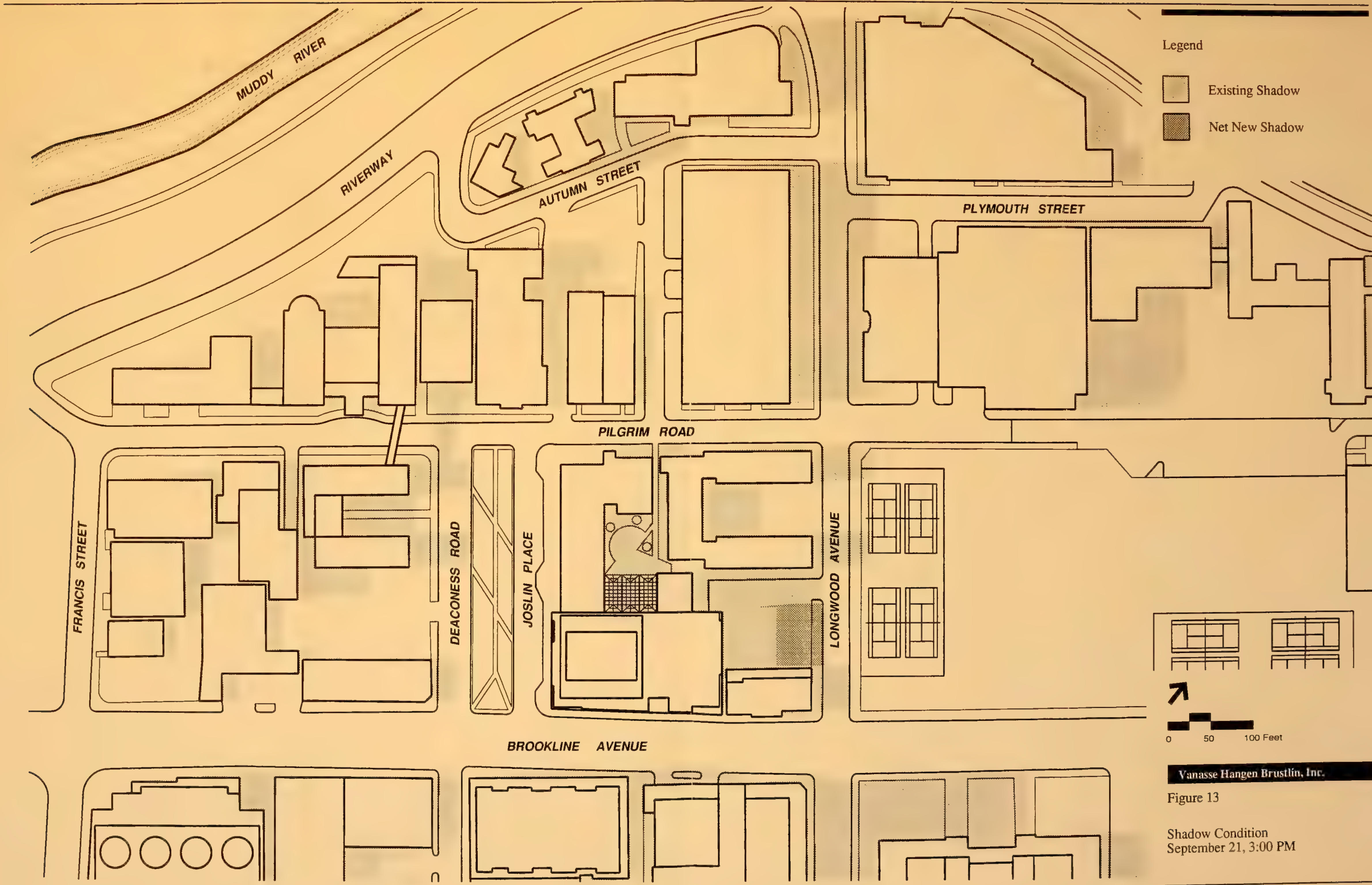
Figure 12

Shadow Condition
September 21, 12:00 PM



Vanasse Hangen Brustlin, Inc.

Figure 13

Shadow Condition
September 21, 3:00 PM

Vanasse Hangen Brustlin, Inc.

Figure 14

Shadow Condition
December 21, 9:00 AM

Vanasse Hangen Brustlin, Inc.

Figure 15

Shadow Condition
December 21, 12:00 PM

Vanasse Hangen Brustlin, Inc.

Figure 16

Shadow Condition
December 21, 3:00 PM

A geotechnical analysis of existing sub-soil conditions and the impact of excavation and sub-grade construction is presented on the following pages.

HALEY & ALDRICH INC.

Geotechnical Engineers &
Environmental Consultants

7 March 1991
File No. 10657

Joslin Diabetes Center
One Joslin Place
Boston, Massachusetts 02215

RT
28513.00
41

Attention: Ms. Constance Stubbs

Subject: BRA Scope Determination
Joslin Clinic Expansion
Boston, Massachusetts

Gentlemen:

We have been requested by Ellenzweig Associates, Inc. to provide input in response to "Item 3. Geotechnical Impact," on Page 7 of the the BRA Scoping Determination Requirements for the project. The following is our suggested response:

> The Joslin Clinic facilities in Boston include the original clinic building along Joslin Road and Pilgrim Road to the north and west, and the Root Wing building along Brookline Avenue to the south and east. There is a courtyard between the two buildings. A retaining wall separates the courtyard from a walkway and a nearby four-story building with one basement level along the northeast side of the courtyard. A pedestrian tunnel passes below the courtyard connecting the Root Wing with the original building.
>
> Existing ground surface grade in the courtyard varies from approximately El. 39 to El. 41. Lowest floor grades in the Joslin Clinic buildings are approximately El. 26 for the Root Wing and El. 39 for the original building. Basement grade in the four-story building to the northeast is approximately El. 32. The walkway grade is about El. 51. The pedestrian tunnel floor grade varies from about El. 26 to El. 29. Available drawings do not show utilities in the area of existing courtyard.

Branch Offices

Affiliate

Available data from test borings drilled at the site in 1972 indicate that the expected soil profile below ground surface in the courtyard consists of about 5 to 10 ft. of miscellaneous fill overlying 10 to 30 ft. of stratified sand, silt and sandy clay, overlying stiff to hard clay to greater than 70 ft. depth. Greater fill thicknesses may exist adjacent to the existing footings for the Root Wing Building.

Groundwater levels measured in groundwater observation wells in 1972 and 1974 at the site were generally below El.30. Current groundwater levels are likely lower than this due to an existing underdrain system below the Root Wing building basement floor slab at approximately El. 26.

Construction of one below-grade level (with lowest floor grade at El. 27.7) is planned for the portion of the courtyard northeast of the pedestrian tunnel. In addition, one above-grade level is planned for the entire courtyard area. Reinforced concrete spread footings are planned for support of proposed structural loads in the courtyard. Proposed footing grades vary from about El. 24 (in the below-grade area) to El. 36 (where no below-grade construction is planned) to match the grades of footings supporting the tunnel and surrounding Joslin Clinic buildings. The underdrain system below the Root Building slab will likely be extended below the proposed below-grade area.

Approximately 1000 to 1500 cubic yards of excavation is required for the below-grade construction. It is expected that excavation will be accomplished by backhoe. Sheeting is planned along the existing retaining wall (northeast side of of the below-grade level) to minimize the potential for ground movements outside the excavation at the adjacent four-story building. Sheeting may also be required adjacent to the footings of the original building along the southwest side of the courtyard.

Quantities of groundwater entering the excavation are expected to be small. Groundwater and surface water are expected to be removed by surface pumping during construction. The extension of the existing underdrain system from below the Root Wing to the proposed below-grade area in the courtyard is not expected to have any significant impact on existing groundwater levels.

We are hopeful that this response will meet your needs. Please contact us if you have any questions.

Sincerely yours,
HALEY & ALDRICH INC.

Mark P. Mitsch
Senior Engineer

David E. Thompson
President

DET/MPM/jos1

c: Mr. Robert Tallis, Ellenzweig Associates

a. Construction Period

Henry E. Wile Corp. anticipates the following quantities of construction debris: Concrete demolition--140 CY; interior demolition--400 CY; excavation--1,590 CY; general debris--2,310 CY. Clean fill material will be sold, and non-suitable fill will be hauled to the Peabody Landfill. Rubbish will be hauled to a legal transfer station, such as the Cambridge Reclamation Facility.

b. Operation of the Project

Current solid waste generation is estimated at 5 to 6 compacted cubic yards (CY) per day. It is removed by Browning Ferris Industries through arrangements with New England Deaconess Hospital. General office waste stream is taken to NEDH compactor, picked up by BFI, Inc. and delivered to a Boston transfer station, where it is loaded into 100 yard containers for delivery to BFI contract landfills. Based on the projected growth in staff size and patient volume over the next five years, Joslin expects an increase of 2 compacted yards daily before taking the effects of recycling and waste reduction into account.

c. Biomedical Wastes

Joslin expects the amount of annual biomedical waste to go from 85 CY to 100 CY. It is collected weekly from the research division and twice weekly from the clinical laboratory by Browning Ferris Industries - Merrimack Valley. This waste is all incinerated with the remaining ash and particulate matter landfilled.

d. Recycling and Waste Reduction

We currently recycle approximately 24,000 lbs. of paper per year, through the B. Ginsberg Co. This consists mostly of computer printouts, laboratory slips, and financial records. Styrofoam insulated shipping containers are recycled by reusing them to ship samples between vendors and other institutions.

Further plans to promote recycling and reduction of waste generation are in the development state. Early strategies are to focus on the major sources of paper and to evaluate alternatives. For example, we are reviewing reports generated in the Data Center to see which ones can be integrated with others or deleted altogether. The building project itself will also lead to opportunities for waste reduction. The availability of two new glass washing rooms will allow a shift from plastic to glass containers in the research division. Collection rooms for recyclable materials will be provided on all three floors of the New Addition and a main Recyclable Storage Room is being created in the Basement of the existing building to support greater recycling volume.

H.E. Wile Corp. has analyzed the construction impact of the proposed project and has offered the following evaluations:

(a) Dust Control and Pollutants

H.E. Wile Corp. will maintain an effective dust control program throughout the project. The potential for dust emissions will occur from excavations in the courtyard and from major demolition activities. These can be adequately controlled by wetting down the affected areas together with coverings or enclosures where appropriate or necessary.

Potential air pollutants from construction equipment shall be kept to a minimum by:

1. Utilizing electric power for hoisting equipment and other smaller equipment.

2. Where diesel or gas engine equipment must be used it shall be turned off when not in use.

(b) Noise Mitigation

The impact of noise on the neighborhood shall be minimized by enclosing the area of heavy demolition (This work will go on for a limited time only). The utilization of electric powered construction equipment wherever possible will further mitigate noise pollution. Noise generating activities such as Pile Driving or Blasting will not be a required part of this project. Where noise levels are above desirable levels the source shall be baffled to bring the noise level down.

(c) Construction Staging Areas and Worker Parking

The Primary Staging Area for the Project will be the existing Joslin Parking Area accessed from Longwood Ave. Materials deliveries from Brookline Ave. will be kept to a minimum.

All construction workers will be encouraged to use Public Transportation due to the lack of available parking. Joslin will make MBTA pass subsidies available. Workers will be informed that they are not allowed to park on neighborhood streets or in the Hospital Parking Facilities. MASCO will make off-site space available at prevailing rates. Joslin will arrange information sharing for car pools.

(d) The hours of construction activity will normally run on a 8 hour work day and not start prior to 7:00 a.m.

(e) Construction Access Routes

This project is principally a Roof Top Addition which substantially reduces the volume of 'bulk' trucking such as required for excavation, backfill and heavy concrete foundations. Therefore, we would expect an average of no more than three trucks per day of bulk deliveries, not counting small incidental tool deliveries and service trucks.

The primary routes for trucking to the jobsite will be from Route 9, Boylston Street onto Brookline Avenue to Longwood Avenue and from the Southeast Expressway across Melena Cass Blvd. to Longwood Avenue.

(f) Pedestrian Safety

While the overhead work is in progress, there will be special attention taken for the protection of pedestrian traffic. There will be covered barricades provided along Brookline and Joslin Place. Pedestrians will be guided under the current Joslin building so that the same traffic flow can be maintained. The existing exclusive drop-off area on Joslin Place will be maintained for the convenience of the patients. The retail facilities on the first floor of Joslin will be maintained during the construction process.

Archios, Inc., of Cambridge, Mass. currently provides the Joslin Diabetes Center with Pest Management services including weekly inspections and monitoring of all interior and exterior areas. Coverage will be extended to include Rodent Trapping in all construction, staging, and storage areas before, during and after the construction period. In addition, care will be taken in the storage and disposal of food at the construction site, utilizing only tightly covered containers to avoid attracting rodents.

Urban Design Component D

General Summary:

The program was developed using information received from interviews held with representatives from the Research and Clinic Divisions as well as Administration. The Department Summaries included in this program identify the total areas currently occupied as well as the total areas requested. The total areas allocated to each Division including the areas allocated to the Departments within each Division were adjusted to reflect a total project size approximately equal to that identified in the Planning Objectives (79,000 GSF of new construction). The allocated areas are identified below.

The following chart summarizes the existing gross square foot (GSF) area occupied by the various departments and building components as well as the GSF areas as indicated in preliminary schematic diagrams included in this report.

Date: 3/91

	Existing[1] Total GSF	Proposed Total GSF	New Constr. GSF[4]
BASIC RESEARCH	28,430	62,525	34,095
CLINICAL RESEARCH inclusive of DCCT	2,340	11,010	8,670
RESEARCH ADMIN./SUPPORT	620	3,090	2,470
ANIMAL FACILITY	2,640	2,640	- 0 -
CLINIC	21,290	29,240	7,950
DTU DIABETES TREATMENT UNIT	28,000	17,570[2]	(10,430)
EYE INSTITUTE/RESEARCH	7,760	12,998	5,238
CLINIC ADMIN./SUPPORT	3,610	5,100	1,490
ADMINISTRATION	6,030	8,360	2,330
MAINT. & ENGINEERING	1,250	3,222	1,972
MATERIALS MANAGEMENT	4,260	4,260	- 0 -
CONFERENCE ROOMS/SUPPORT	1,740	8,880	7,140
RETAIL	12,000	12,000	- 0 -
CIRCULATION	33,430	44,852	11,422
MECHANICAL	17,430	17,430[3]	- 0 -
TOTAL	170,830	243,177	72,347

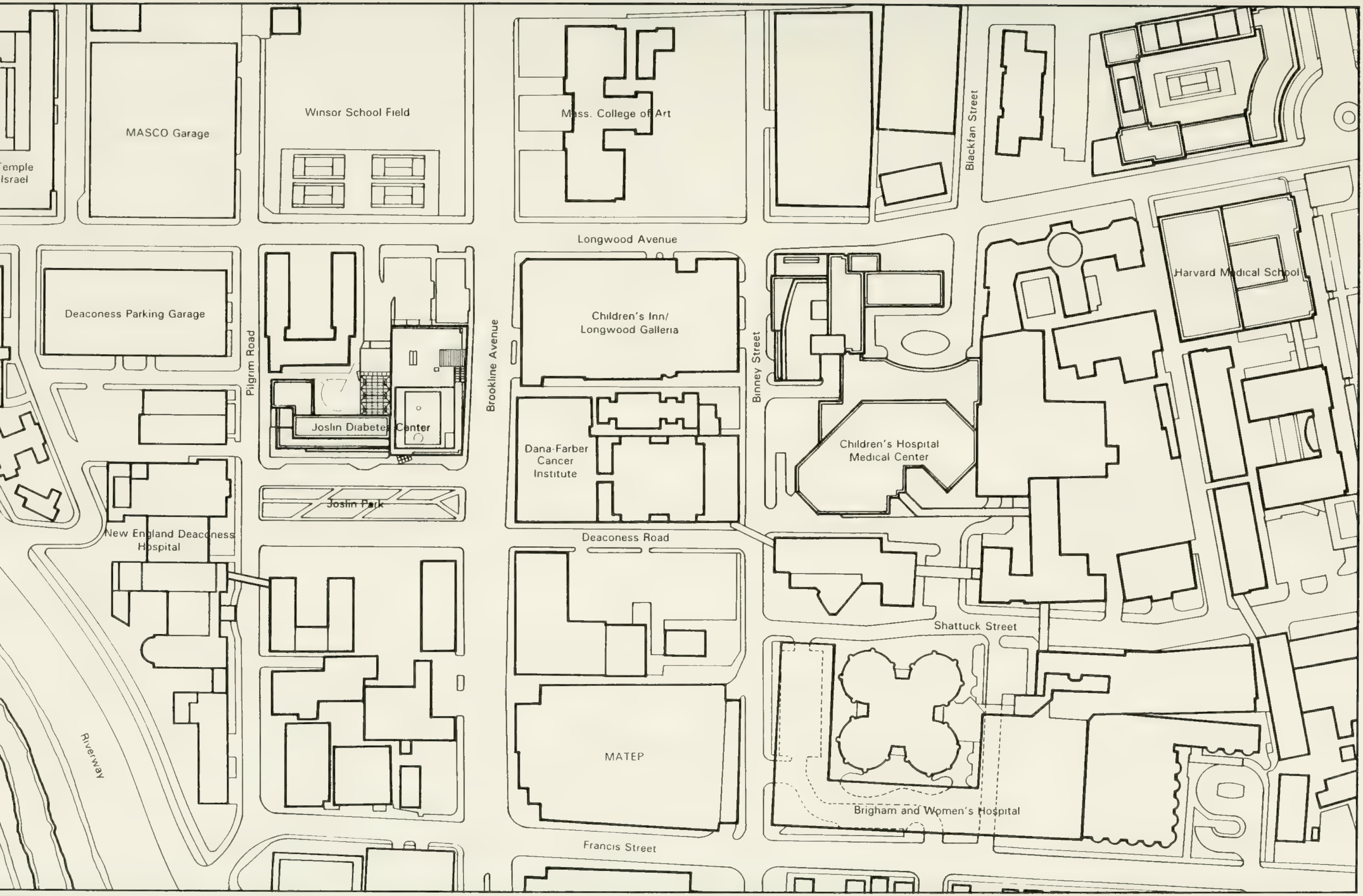
[1] Existing total taken from EAI tabulation dated 11/13/89 - (Existing tabulation also revised as of 1/15/90).

[2] Reduction reflects assumption that space required by DTU will be reduced by 35%.

[3] Area does not include 10,000 GSF for the mechanical penthouse.

[4] GSF is per definition in Boston Zoning Ordinance (Far-GSF)

Plans and sections of the Project in the context of the surrounding neighborhood are presented on the following pages.



Joslin Diabetes Center:
Research and Clinic
Facility Expansion

Ellenzweig Associates, Inc.
Architects
1280 Massachusetts Avenue
Cambridge Mass. 02138
617 491 5575

LeMessurier Consultants
Structural Engineer
1033 Massachusetts Avenue
Cambridge Mass. 02238
617 868-1200

BR+A Consulting Engineers
Mechanical/Electrical Engineer
1320 Soldiers Field Road
Boston Mass. 02135
617 254 0016

Robert W. Sullivan Inc.
Plumbing and Fire Protection Eng.
Unit 302, Union Wharf
Boston Mass. 02109
617 523 8227

Vanasse, Hangen, Brustlin, Inc.
Traffic Consultant
101 Walnut Street
Watertown, Mass. 02172
617 924 1770

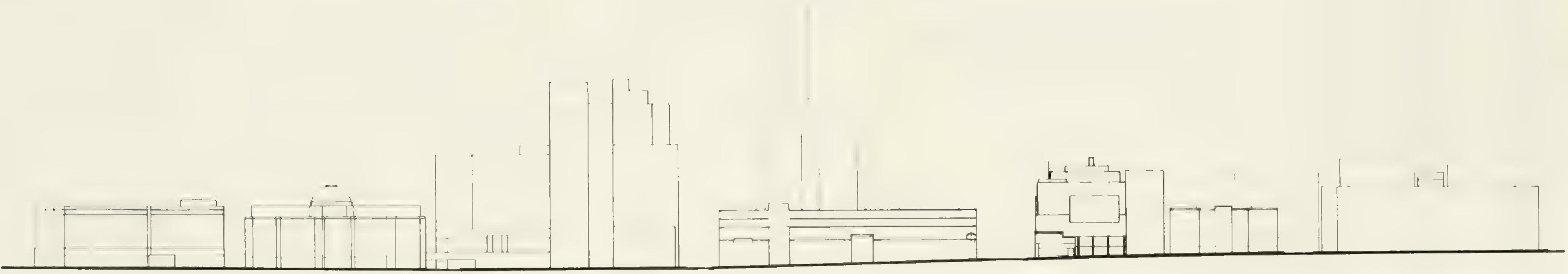
Lerch, Bates & Associates, Inc.
Elevator Consultant
683 Main Street
Norwell Mass. 02061
617 659 15 5

Notes:

Job Number	2891.3.00
Drawn By	
Checked By	
Date	
Scale	
Revised	
File	

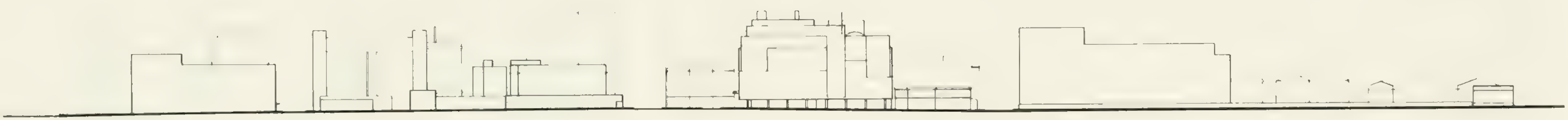
0 10 50 100

Neighborhood
Plan



Harvard Medical School | Children's Hospital Medical Center | Binney Street | Children's Inn | Brookline Avenue | Pilgrim Road | Deaconess Parking Garage

Longwood Avenue Section

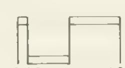


Riverway | Francis Street | New England Deaconess Hospital | Joslin Park | Longwood Avenue | MASCO Parking Garage | Winsor School

Brookline Avenue Section

Joslin Diabetes Center:
Research and Clinic
Facility Expansion

Notes

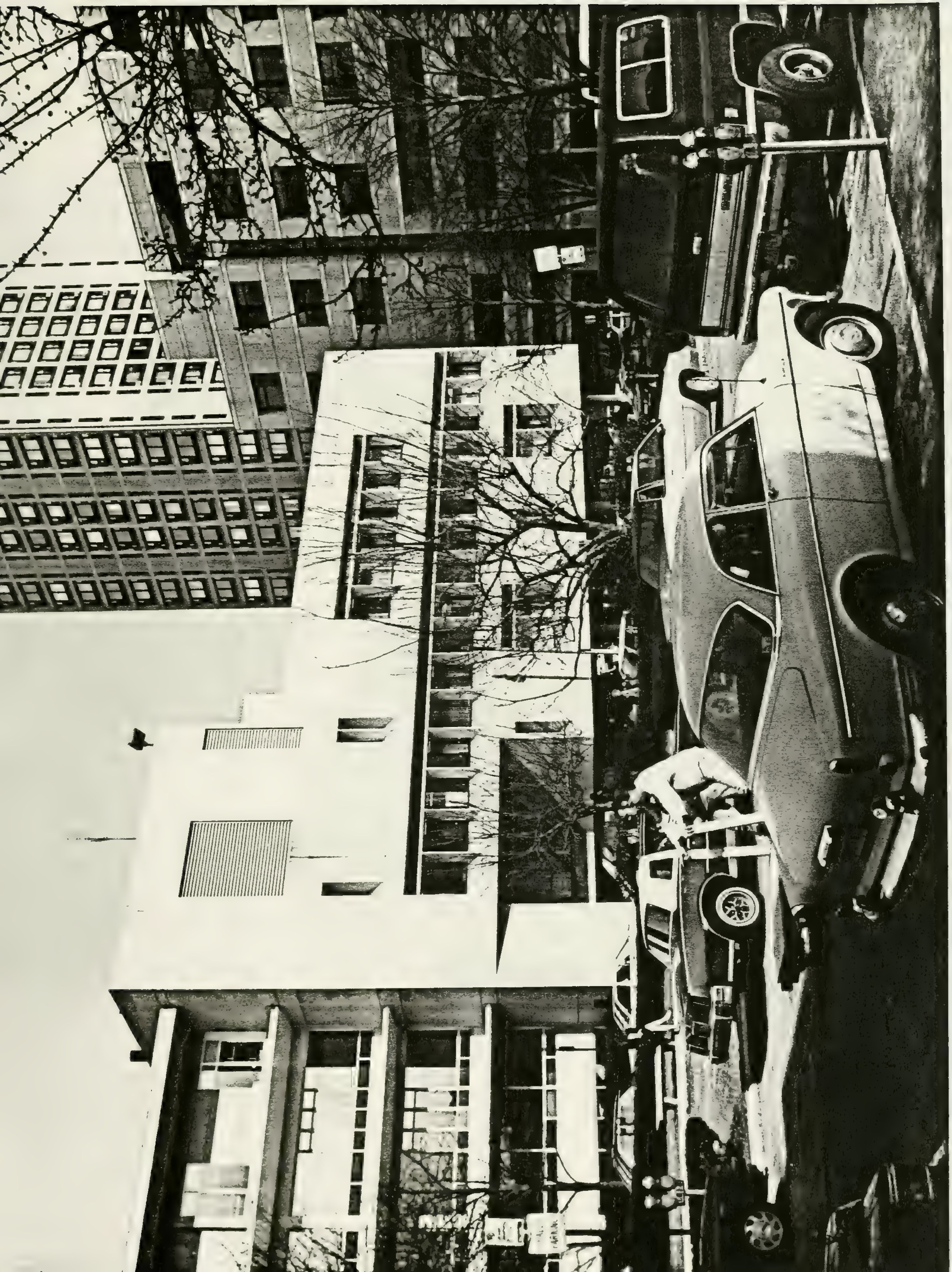


0 10 50 100

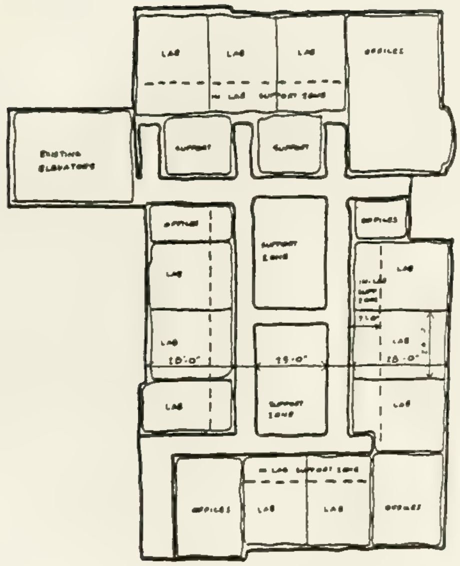
Neighborhood Sections

Black and white photographs of the site, existing buildings, and adjacent neighborhood are presented on the following pages.

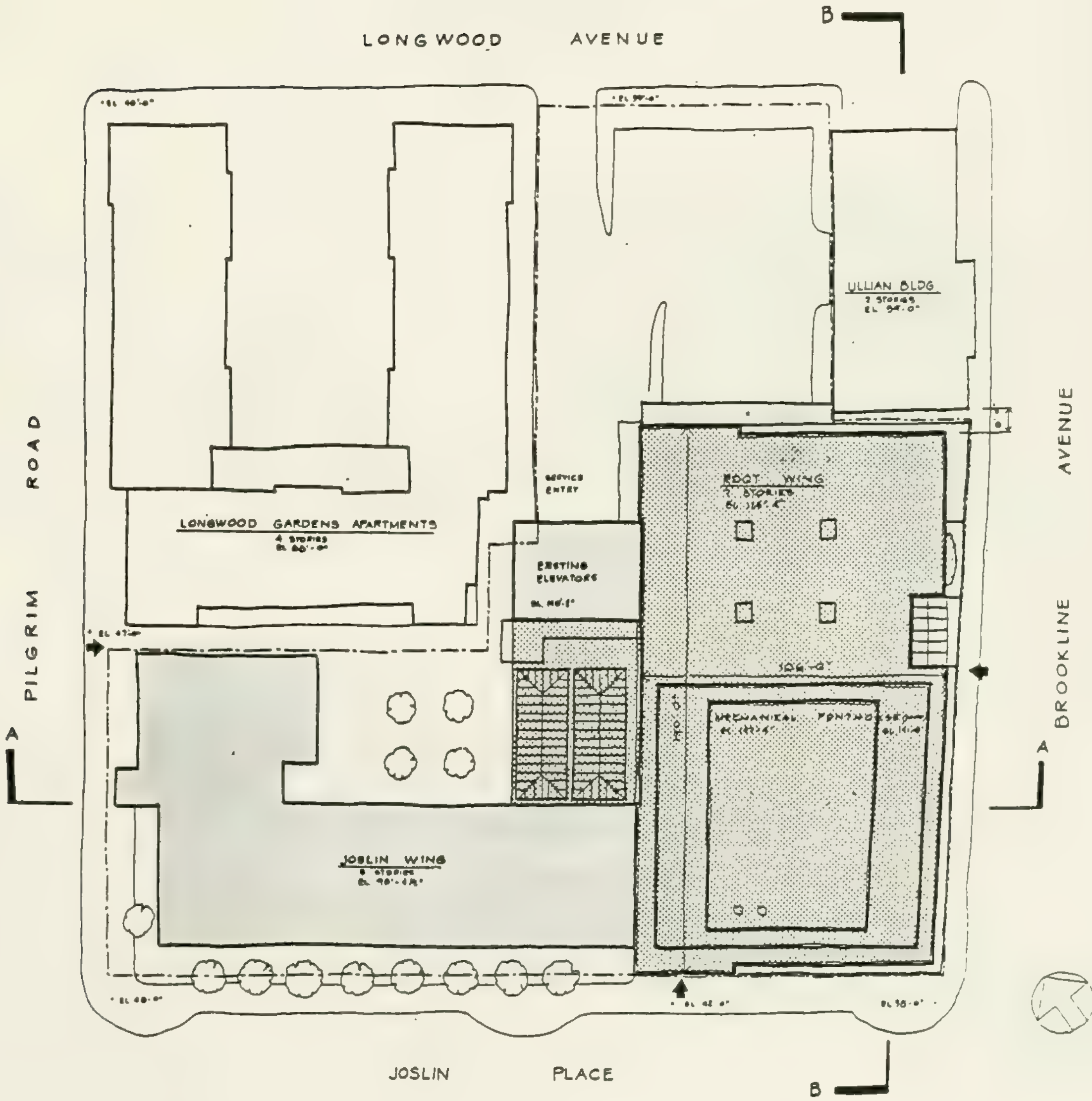

NEW ENGLAND
DEACONESS
HOSPITAL



Plans and axonometric views of earlier siting alternatives are presented in the following pages. These studies were prepared in July of 1990 and presented to Mr. Bob Kroin, Mr. Michael Hunter, and Mr. Bill McCarthy of the Boston Redevelopment Authority on July 12, 1990.



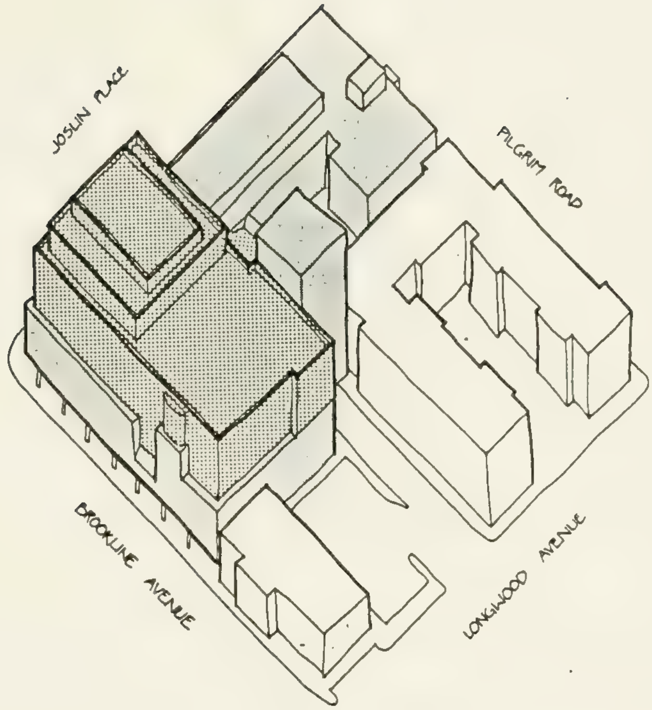
RESEARCH FLOOR DIAGRAM

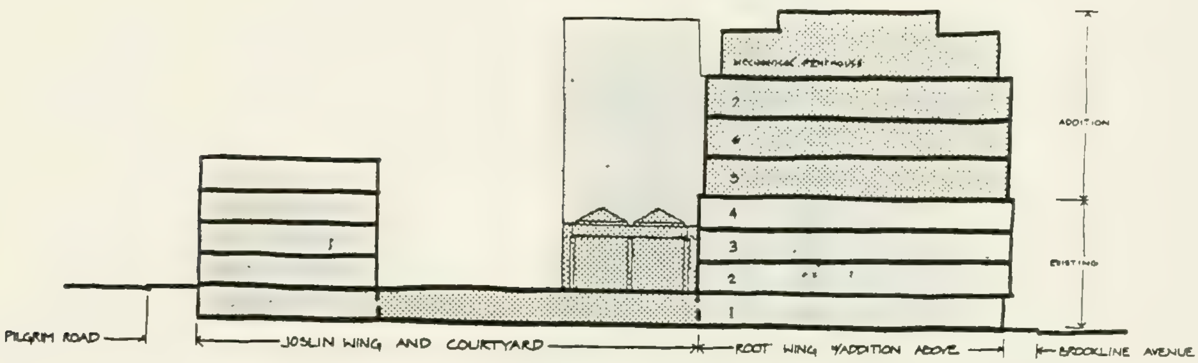


FACILITY EXPANSION
JOSLIN DIABETES CENTER

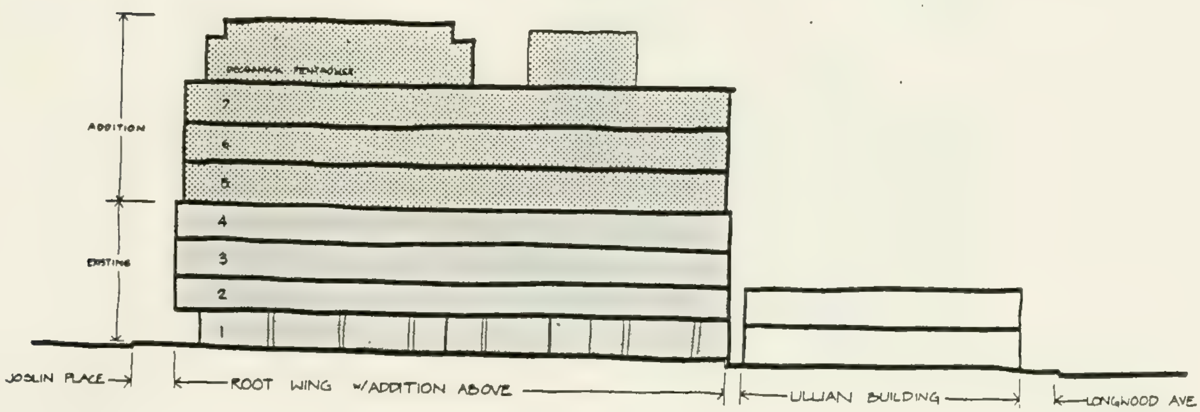
OPTION #1
JULY 1990

ELLENZWEIG ASSOCIATES, INC.
ARCHITECTS





SECTION A-A

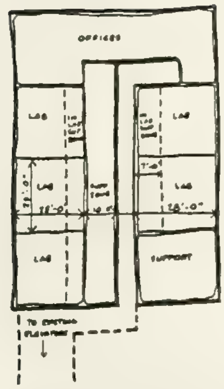


SECTION B-B

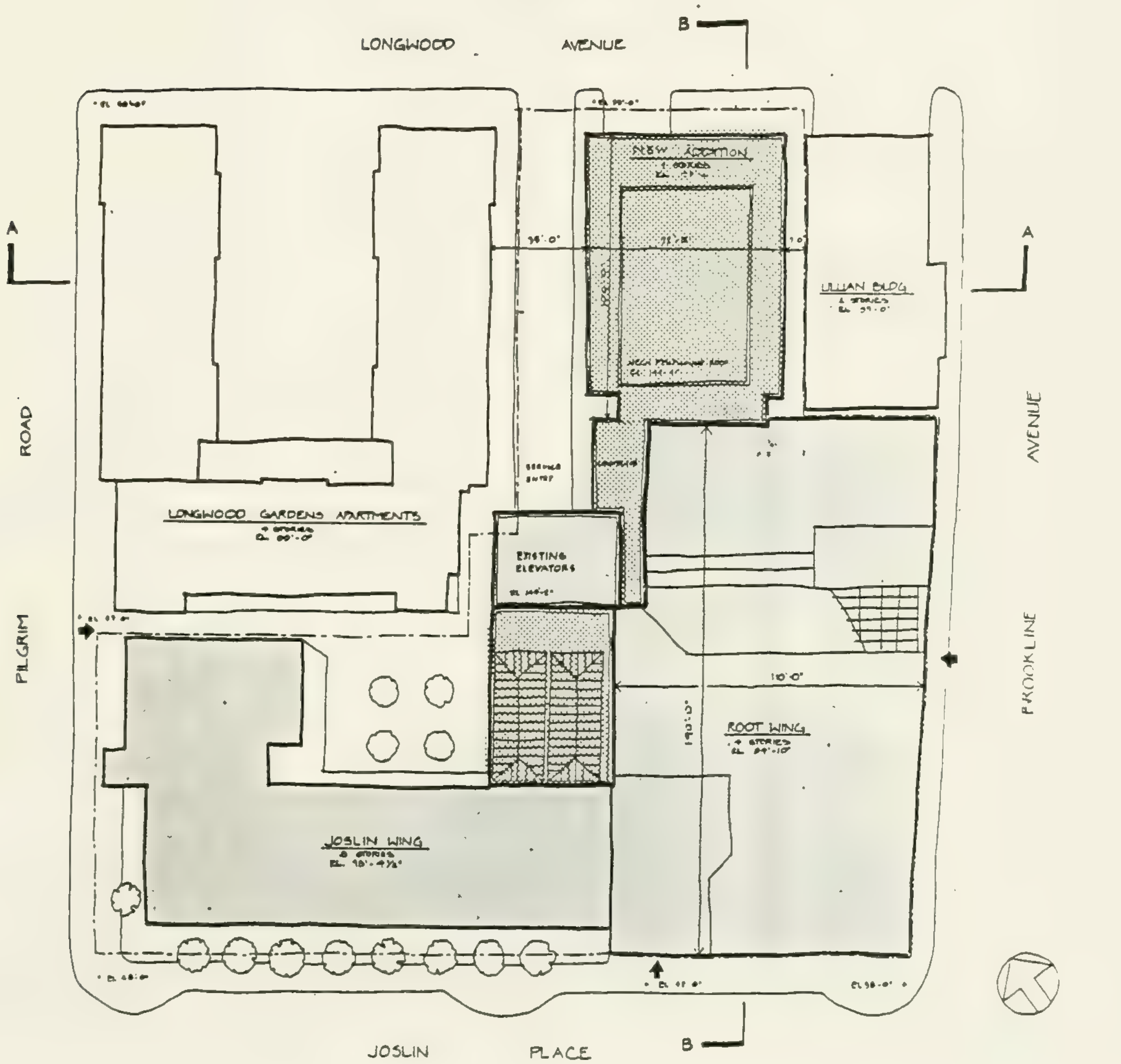
FACILITY EXPANSION
JOSLIN DIABETES CENTER

OPTION #1
JULY 1990

ELLENZWEIG ASSOCIATES, INC.
ARCHITECTS



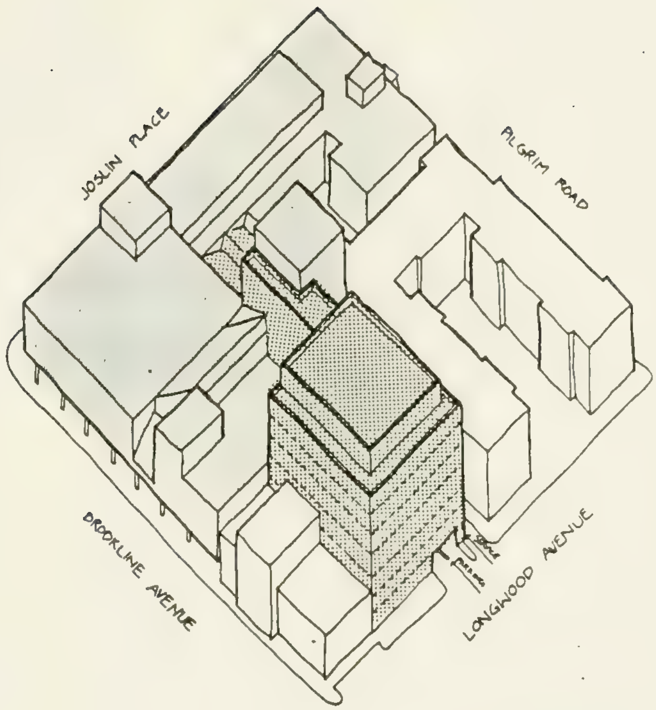
RESEARCH FLOOR DIAGRAM

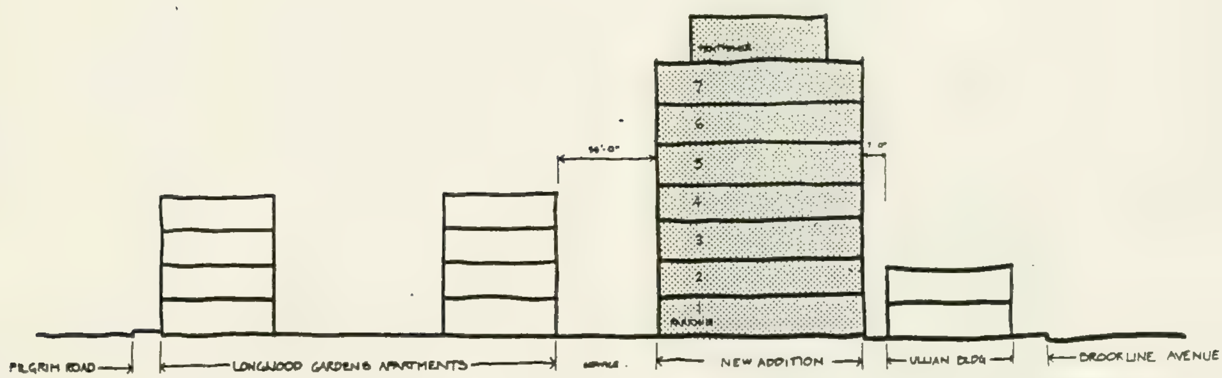


FACILITY EXPANSION
JOSLIN DIABETES CENTER

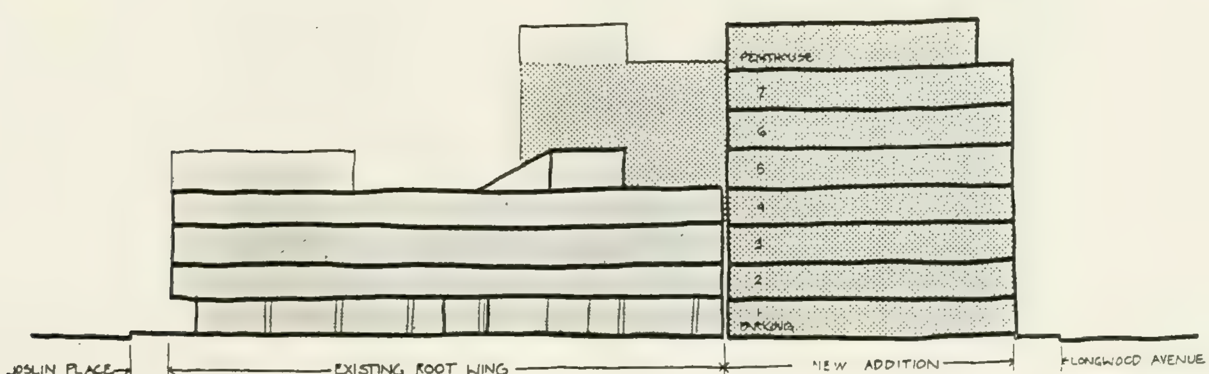
OPTION *2
JULY 1990

ELLENZWEIG ASSOCIATES, INC.
ARCHITECTS





SECTION A·A

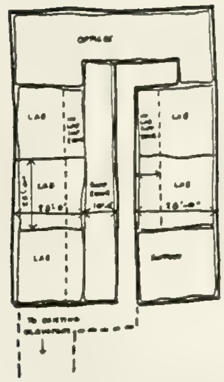


SECTION B·B

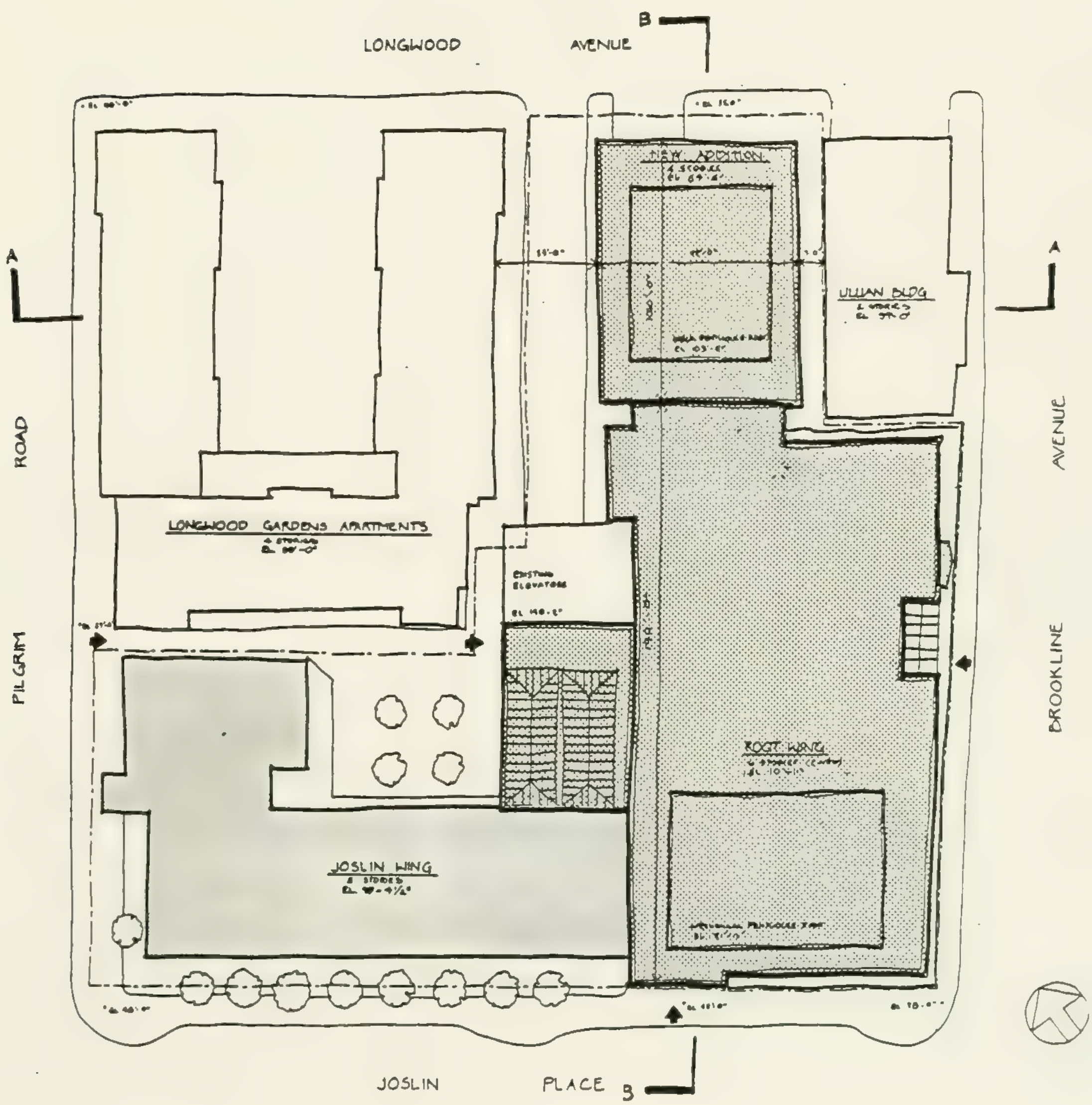
FACILITY EXPANSION
JOSLIN DIABETES CENTER

OPTION #2
JULY 1990

ELLENZWEIG ASSOCIATES, INC.
ARCHITECTS



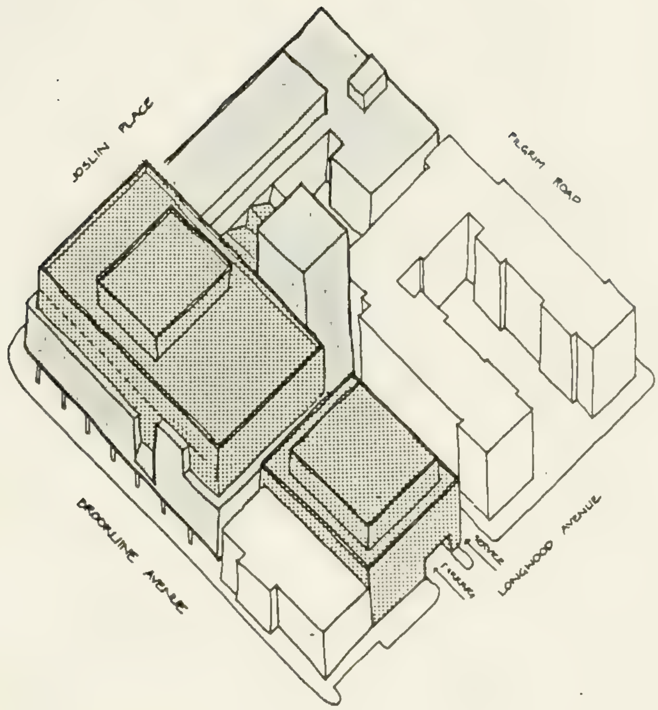
RESEARCH FLOOR DIAGRAM

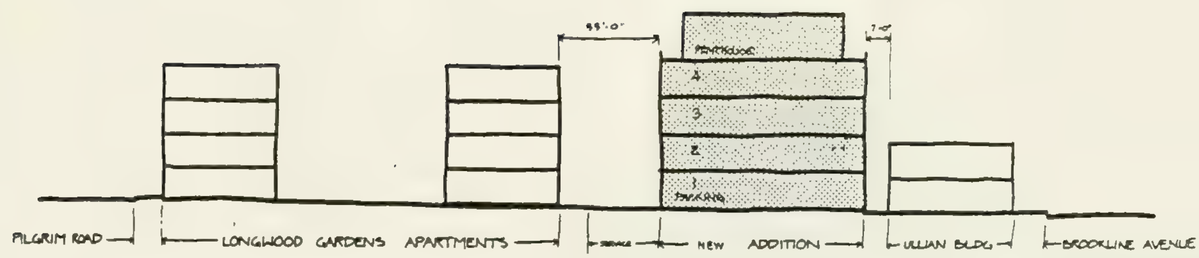


FACILITY EXPANSION
JOSLIN DIABETES CENTER

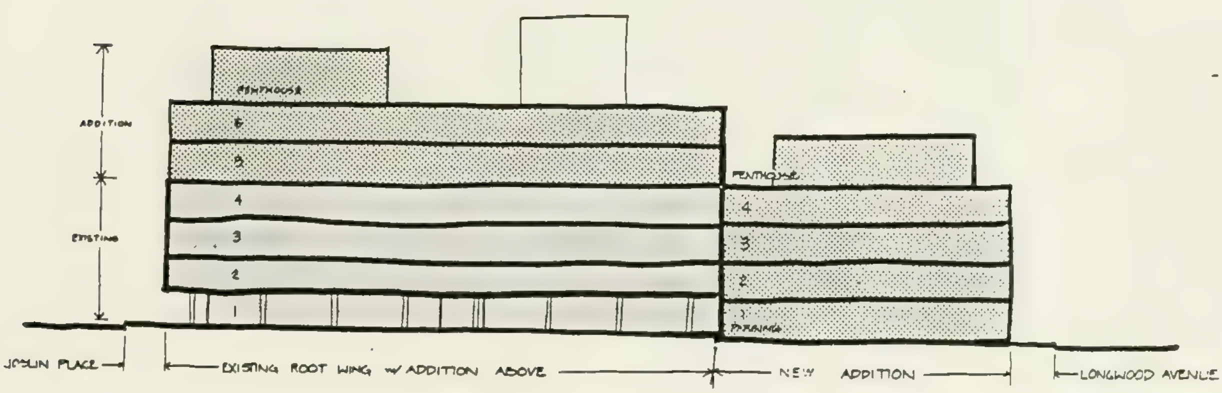
OPTION # 3
JULY 1990

ELLENZWEIG ASSOCIATES, INC.
ARCHITECTS





SECTION A-A



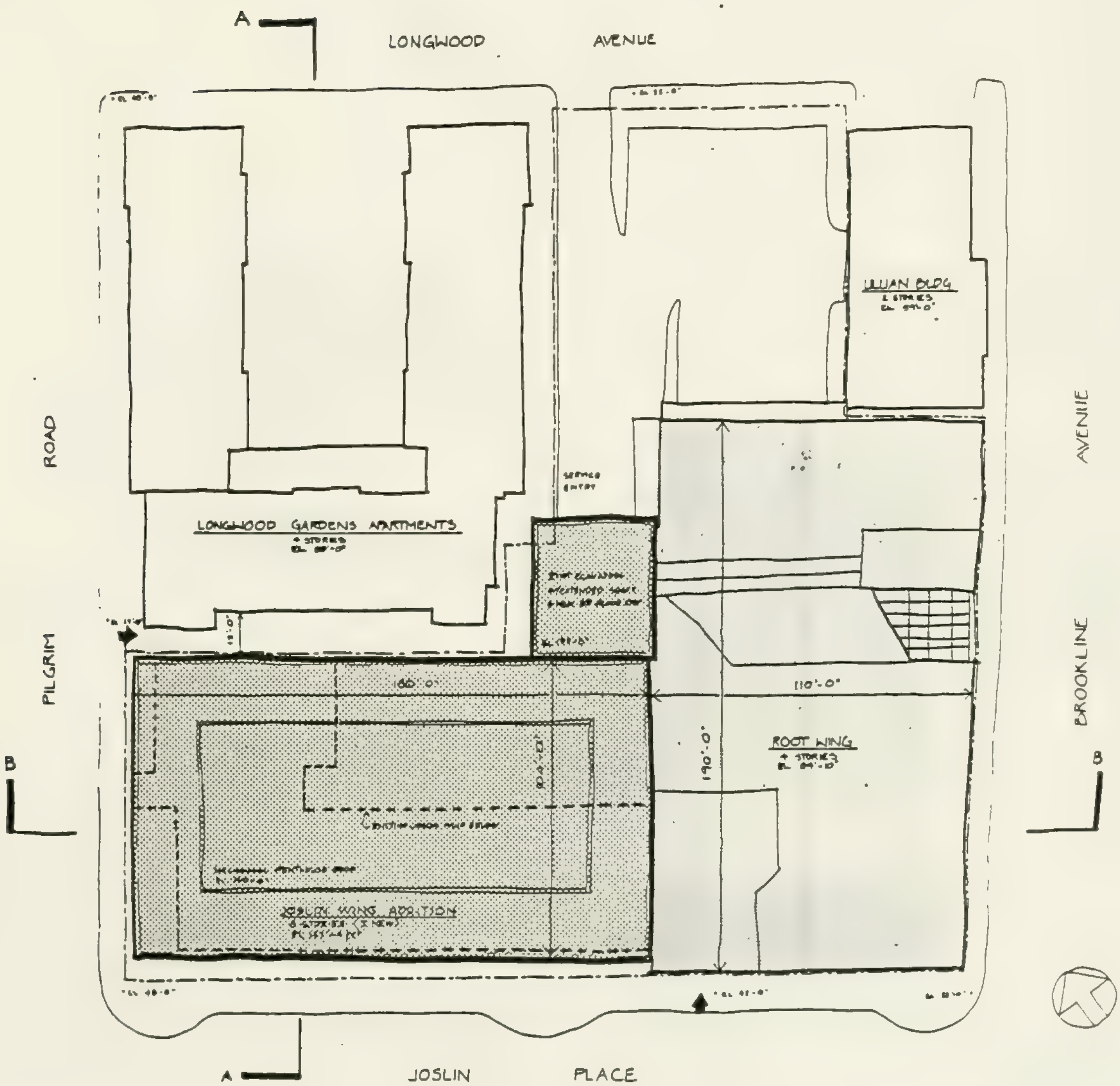
SECTION B-B

FACILITY EXPANSION
JOSLIN DIABETES CENTER

OPTION #3
JULY 1990

ELLENZWEIG ASSOCIATES, INC.
ARCHITECTS

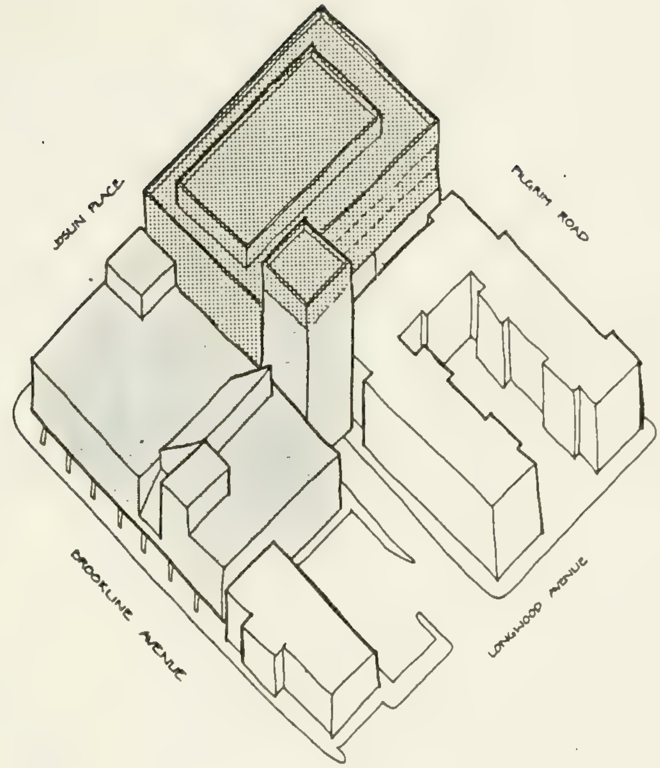
RESEARCH FLOOR DIAGRAM

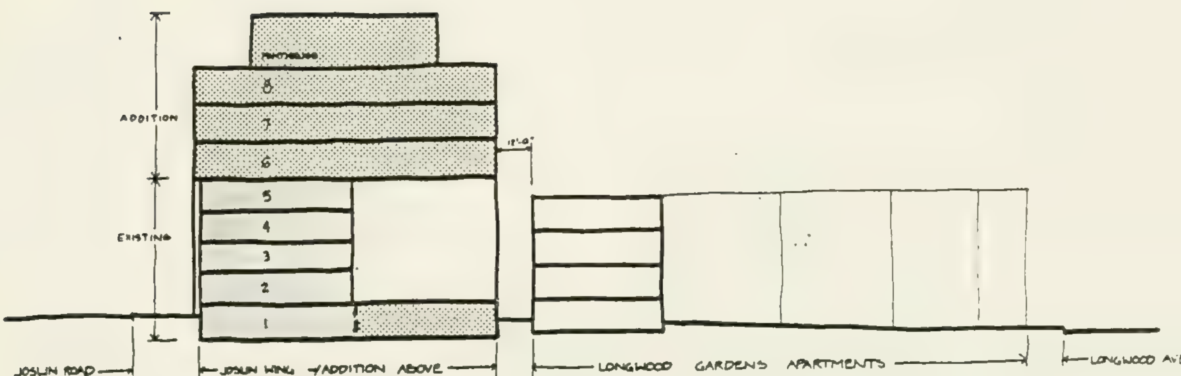


FACILITY EXPANSION
JOSLIN DIABETES CENTER

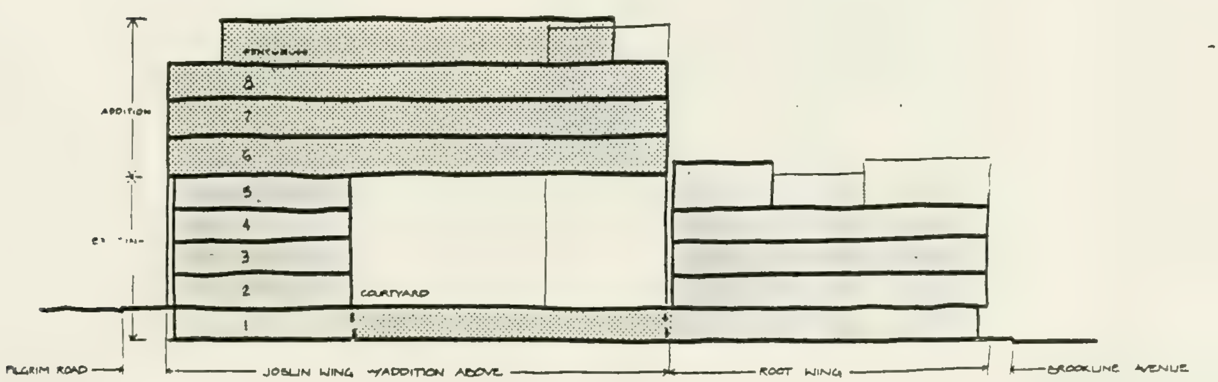
OPTION #4
JULY 1990

ELLENZWEIG ASSOCIATES, INC.
ARCHITECTS





SECTION A-A

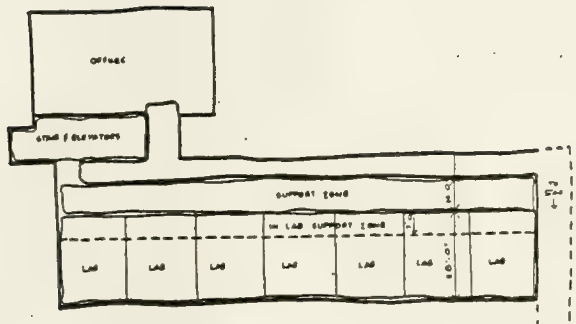


SECTION B-B

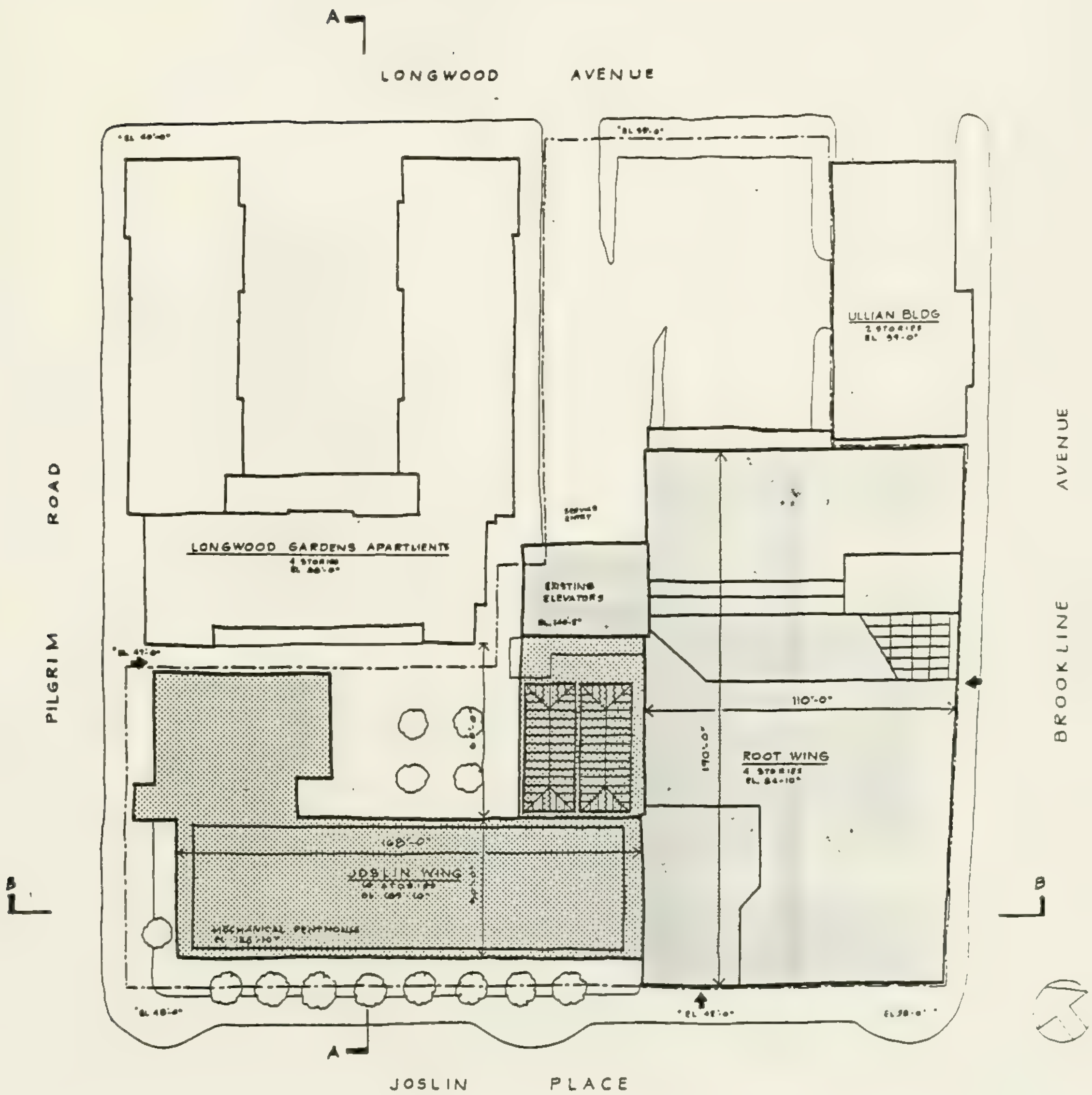
FACILITY EXPANSION
JOSLIN DIABETES CENTER

OPTION #4
JULY 1990

ELLENZWEIG ASSOCIATES, INC.
ARCHITECTS



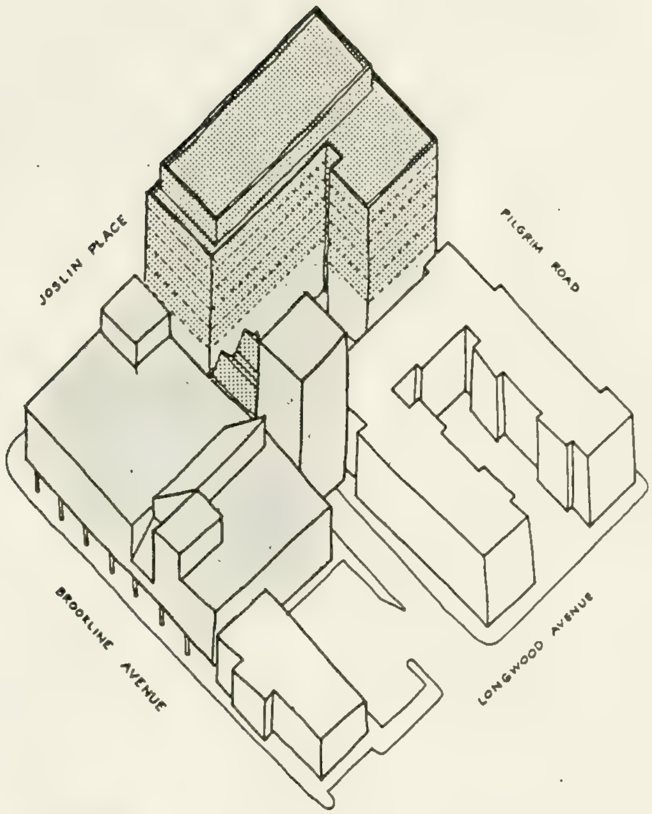
RESEARCH FLOOR DIAGRAM

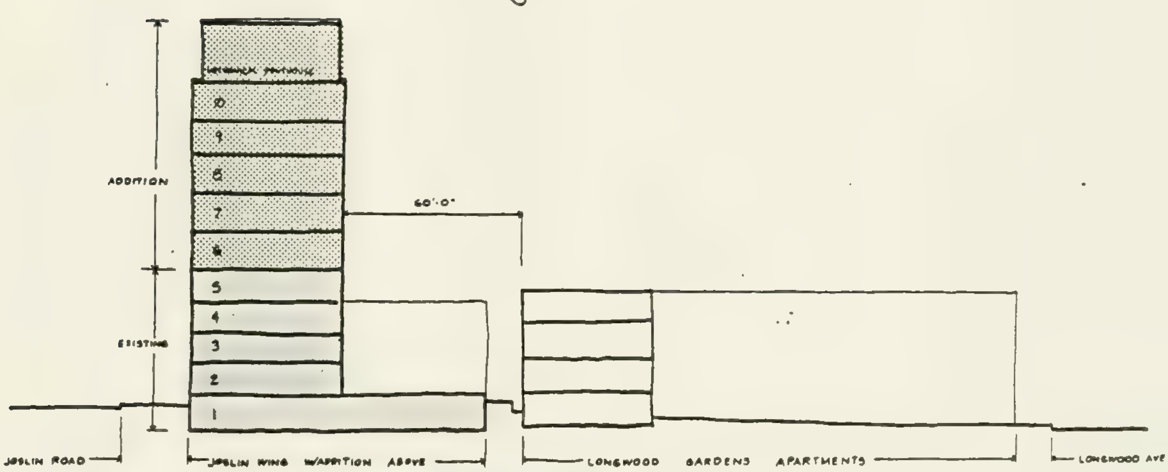


FACILITY EXPANSION
JOSLIN DIABETES CENTER

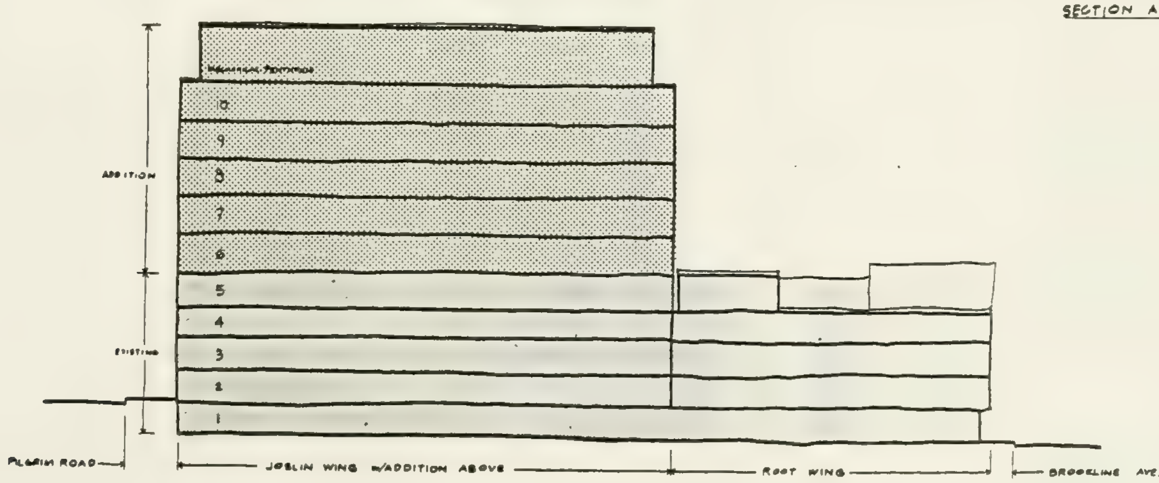
OPTION #4A
JULY 1990

ELLENZWEIG ASSOCIATES, INC
ARCHITECTS





SECTION A-A



SECTION B-B

FACILITY EXPANSION
JOSLIN DIABETES CENTER

OPTION #4A

ELLENZWEIG ASSOCIATES, INC.
ARCHITECTS

Two eye level perspective views of the Project are presented on the following pages. These views show the Existing Root Wing and Proposed Addition as they will appear from Brookline Avenue.

Joslin Diabetes Center: Research and Clinic Facility Expansion	Ellenzweig Associates, Inc Architects 1280 Massachusetts Avenue Cambridge Mass 02138 617 491 5575 LeMessurier Consultants Structural Engineer 1033 Massachusetts Avenue Cambridge Mass 02138 617 868 1200 BR+A Consulting Engineers Mechanical/Electrical Engineer 1320 Soldiers Field Road Boston Mass 02135 617 254 0016	Robert W Sullivan Inc Plumbing and Fire Protection Eng Unit 302 Union Wharf Boston Mass 02109 617 523 8227 Vanasse Hangen Brustlin Inc Traffic Consultant 101 Walnut Street Watertown Mass 02272 617 924 1770 Lerch Bates & Associates Inc Elevator Consultant 683 Main Street Norwell Mass 02061 617 659 1515	Notes:	Job Number Drawn By Checked By Date Scale Revised File

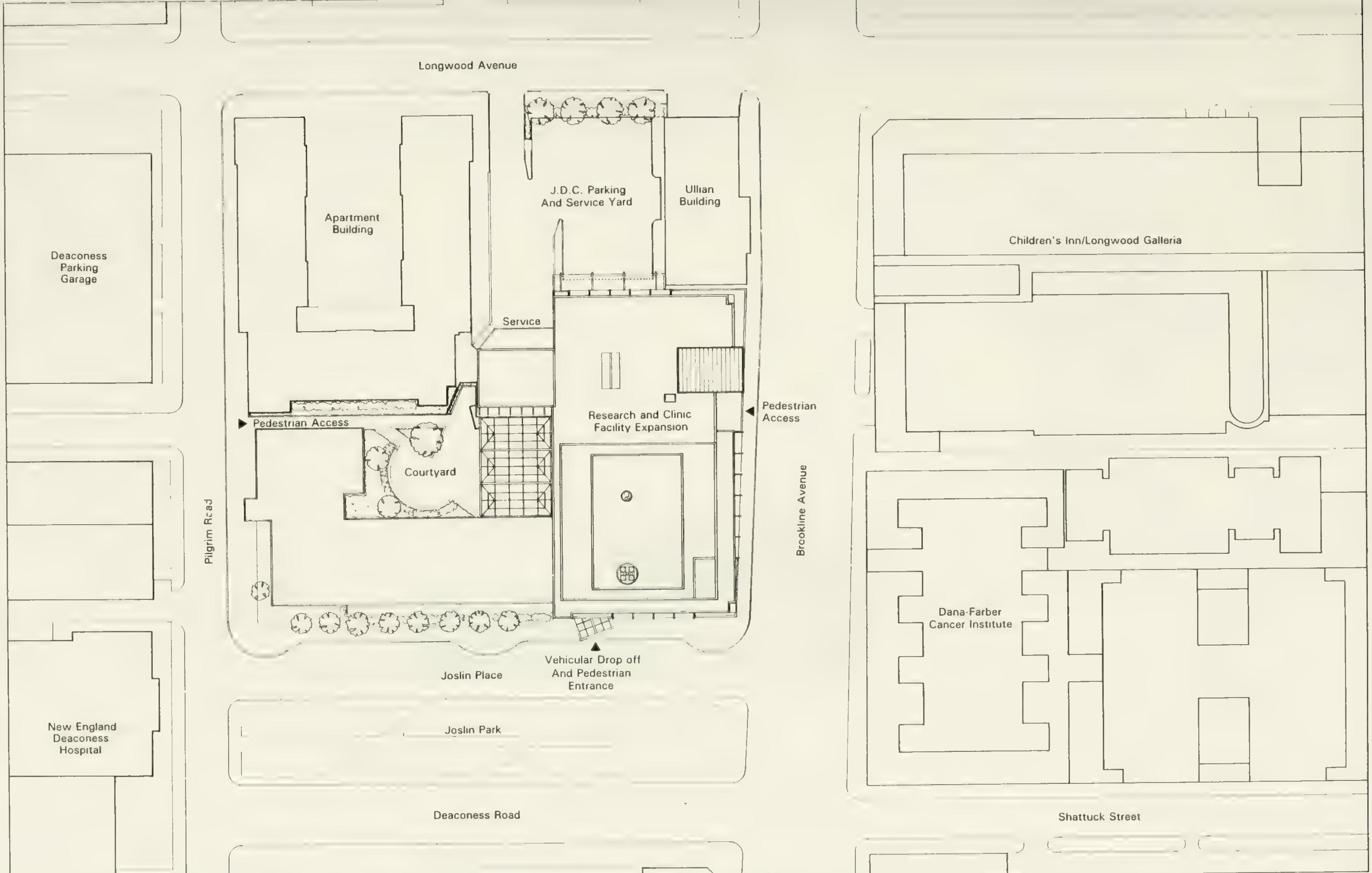
PERSPECTIVE VIEW

Joslin Diabetes Center: Research and Clinic Facility Expansion	Ellenzweig Associates Inc Architects 1280 Massachusetts Avenue Cambridge Mass 02138 617 491 5575 LeMessurier Consultants Structural Engineer 1033 Massachusetts Avenue Cambridge Mass 02238 617 868 1200 BR+A Consulting Engineers Mechanical Electrical Engineer 1320 Soldiers Field Road Boston Mass 02135 617 254 0016	Robert W Sullivan Inc Plumbing and Fire Protection Eng unit 302 Union Wharf Boston Mass 02109 617 523 8227 Vanasse Hangen Brustlin Inc Traffic Consultant 101 Walnut Street Watertown Mass 02172 617 924 1770 Lerch Bates & Associates Inc Elevator Consultant 883 Main Street Norwell Mass 02061 617 659 1515	Notes	Job Number Drawn By Checked By Date Scale Revised File

PERSPECTIVE VIEW

An aerial photograph of the Longwood Medical Area looking west-northwest towards downtown Boston is presented on the following page. The existing Joslin Wing and Root Wing and the Joslin Diabetes Center are visible in the lower left-hand portion of the photograph.

A site plan and sections showing the proposed project in the context of its immediate site are presented on the following pages. A certified plot plan of the site is also presented to show the boundaries of the site, existing elevations, utility information, and the relationships of adjacent structures.



Joslin Diabetes Center:
Research and Clinic Facility Expansion

Notes

Site Plan

Joslin Diabetes Center:
Research and Clinic
Facility Expansion

Ellenzweig Associates, Inc
Architects
1280 Massachusetts Avenue
Cambridge Mass 02138
617 491 5575

LeMessurier Consultants
Structural Engineer
1033 Massachusetts Avenue
Cambridge Mass 02238
617 868 1200

BR+A Consulting Engineers
Mechanical/Electrical Engineer
1320 Soldiers Field Road
Boston Mass 02135
617 254 0016

Robert W. Sullivan Inc
Plumbing and Fire Protection Eng
Unit 302 Union Wharf
Boston Mass 02109
617 523 8227

Vanasse Hangen Brustlin Inc
Traffic Consultant
101 Walnut Street
Watertown Mass 02172
617 924 1770

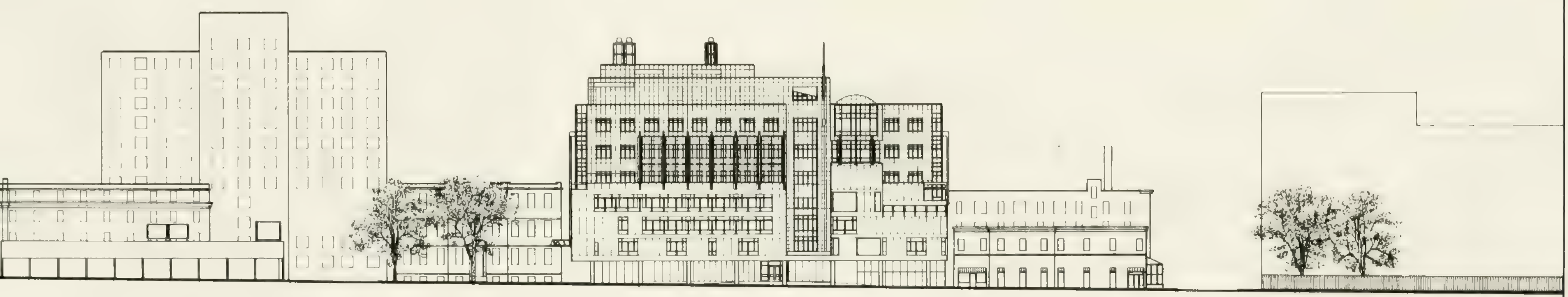
Lerch, Bates & Associates Inc
Elevator Consultant
883 Main Street
Norwell Mass 02061
617 659 1515

Notes:

Job Number	28911.00
Drawn By	
Checked By	
Date	
Scale	
Revised	
File	

0 10 20 40

Site Section



Joslin Diabetes Center: Research and Clinic Facility Expansion	Ellenzweig Associates Inc Architects 1280 Massachusetts Avenue Cambridge Mass. 02138 617 491 5575 LeMessurier Consultants Structural Engineer 1033 Massachusetts Avenue Cambridge Mass. 02238 617 868 1200 BR+A Consulting Engineers Mechanical/Electrical Engineer 1320 Soldiers Field Road Boston Mass. 02135 617 254 0016	Robert W. Sullivan Inc. Plumbing and Fire Protection Eng. Unit 302 Union Wharf Boston Mass. 02109 617 523-8227 Vanasse, Hangen, Brustlin, Inc Traffic Consultant 109 Walnut Street Watertown Mass. 02172 617 924 1770 Lerch Bates & Associates, Inc. Elevator Consultant 883 Main Street Norwell Mass. 02061 617 659-1518	Notes:	Job Number 28913.00 Drawn By Checked By Date Scale Revised File	0 10 20 40

Site Section

Joslin Diabetes Center:
Research and Clinic
Facility Expansion

Ellenzweig Associates Inc
Architects
1280 Massachusetts Avenue
Cambridge Mass 02138
617 491 5575

LeMessurier Consultants
Structural Engineer
1033 Massachusetts Avenue
Cambridge Mass 02238
617 868 1200

BR+A Consulting Engineers
Mechanical/Electrical Engineer
1320 Soldiers Field Road
Boston Mass 02135
617 254 0016

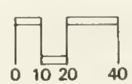
Robert W Sullivan Inc
Plumbing and Fire Protection Eng
Unit 302 Union Wharf
Boston Mass 02109
617 523 8227

Vanasse Hangen Brustlin Inc
Traffic Consultant
101 Walnut Street
Watertown Mass 02172
617 924 1770

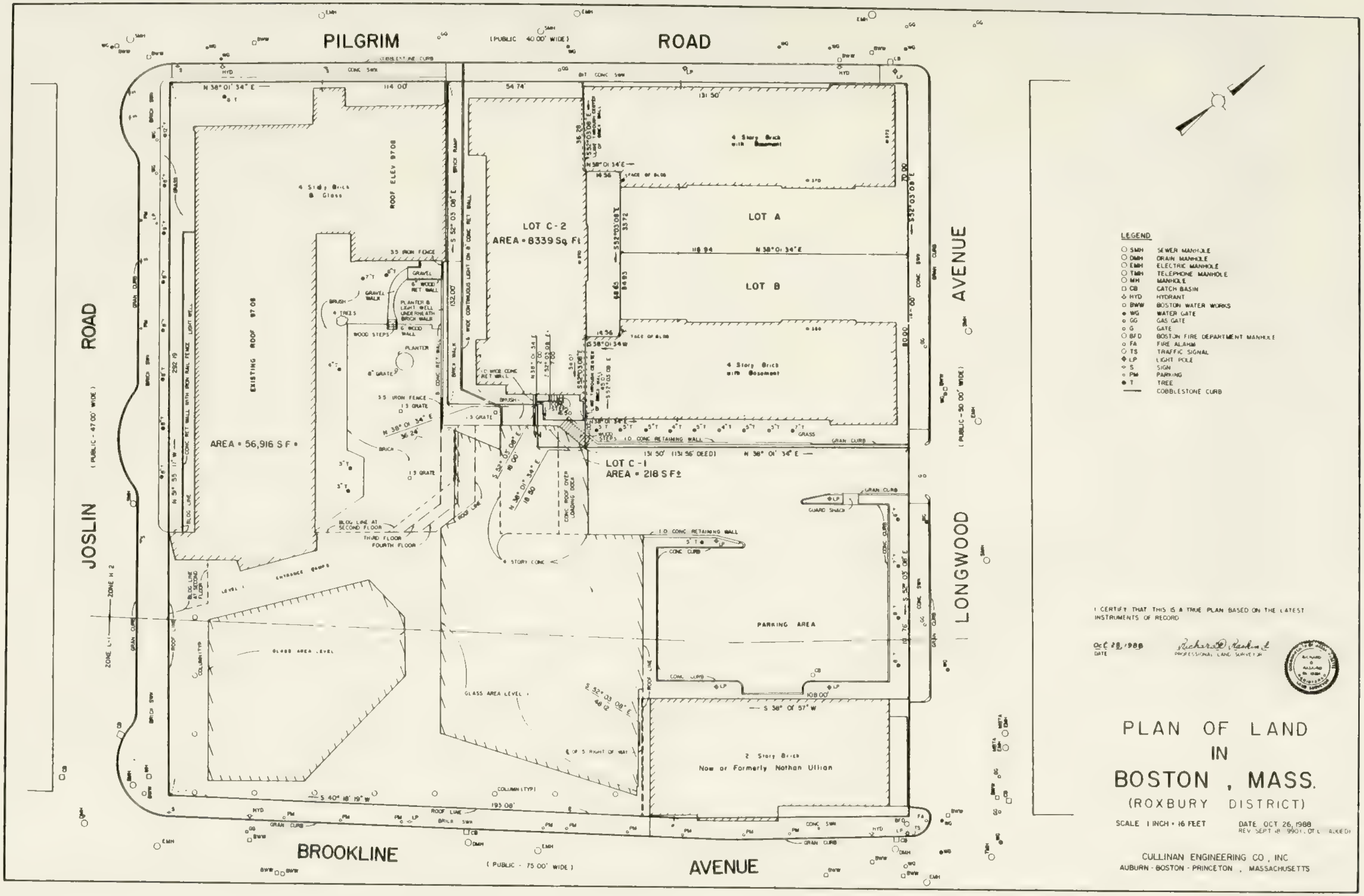
Lerch Bates & Associates Inc
Elevator Consultant
883 Main Street
Norwell Mass 02061
617 659 1515

Notes

Job Number	28913.00
Drawn By	
Checked By	
Date	
Scale	
Revised	
File	



Site Section



Joslin Diabetes Center:
Research and Clinic
Facility Expansion

Architects
1280 Massachusetts Avenue
617 868 200
BR+A Consulting Engineers
1320 Soldiers Field Road
Boston Mass 02135
617 254 0016
Robert W Sullivan Inc
Traffic Consultant
Lerch Bates & Associates Inc
617 658 1515

Notes

CERTIFIED PLOT PLAN

L-1.1

A wood massing model of the proposed Project has been constructed and given to the Boston Redevelopment Authority. This model has been prepared at scale of 1" = 100' in order to be incorporated into the Longwood Medical Area model currently being completed by the BRA.

Floor plans, elevations, and building sections of the proposed Project are presented in the following pages. These drawings show the organization of functions and spaces within the Project and indicate new construction areas with a light tone and substantially renovated areas with a darker tone.

Joslin Diabetes Center:

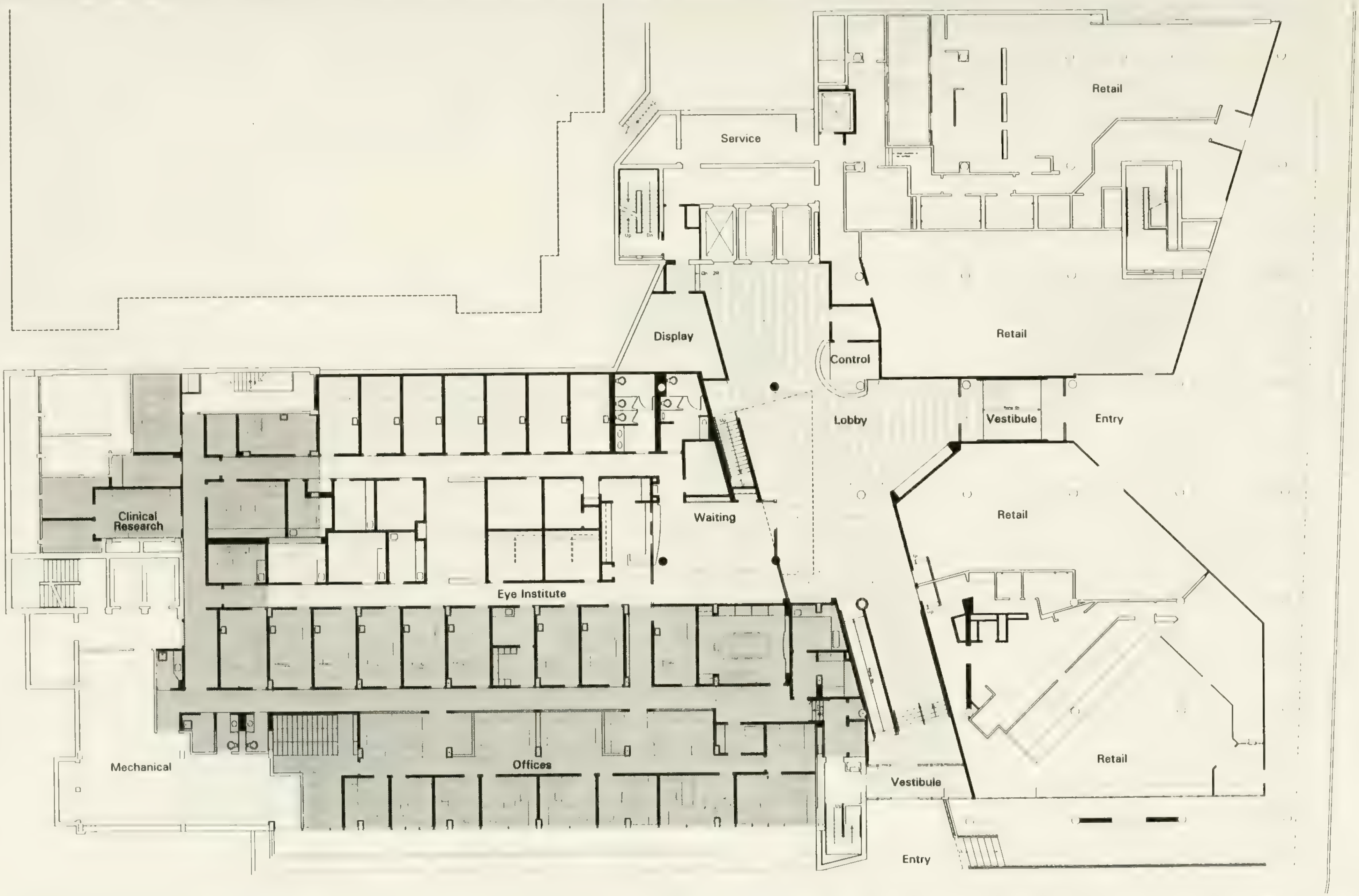
Research and Clinic
Facility Expansion

Notes

Job Number
Drawn By
Date
Scale
Revised

BASEMENT PLAN

A1.1



Joslin Diabetes Center:

Research and Clinic
Facility Expansion

Ellenzweig Associates, Inc
Architects
1280 Massachusetts Avenue
Cambridge Mass 02138
617 491 5575

LeMessurier Consultants
Structural Engineer
1033 Massachusetts Avenue
Cambridge Mass 02138
617 868 1200

BR+A Consulting Engineers
Mechanical/Electrical Engineer
1320 Soldiers Field Road
Boston Mass 02135

Robert W. Sullivan Inc
Plumbing and Fire Protection Eng
Unit 302 Union Wharf
Boston Mass 02109
617 523 8227

Vanasse Hangen Brustlin Inc
Traffic Consultant
101 Walnut Street
Watertown Mass 02172
617 924 1770

Lerch Bates & Associates Inc
Elevator Consultant
883 Main Street
Norwell Mass 02061
617 659 1515

Notes.

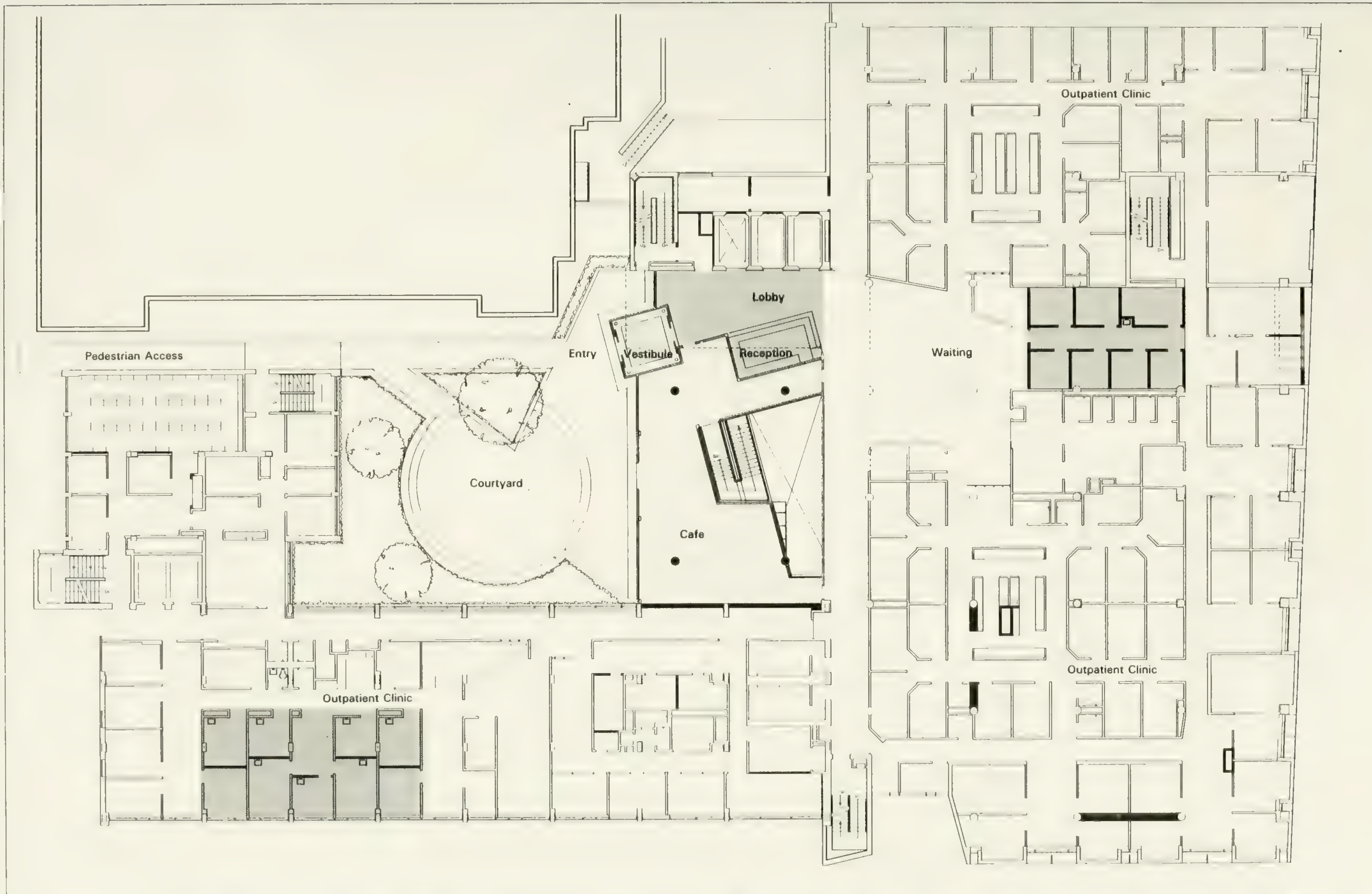
NEW CONSTRUCTION
EXISTING PARTITIONS
FUTURE PARTITIONS
FURNITURE (N.I.C.)

Job Number 28913.00
Drawn By BH
Checked By
Date 1 FEBRUARY 1991
Scale 1/8" = 1' 0"
Revised
File 91350102

PROJECT NORTH

FIRST FLOOR PLAN

A1.2



Joslin Diabetes Center:
Research and Clinic
Facility Expansion

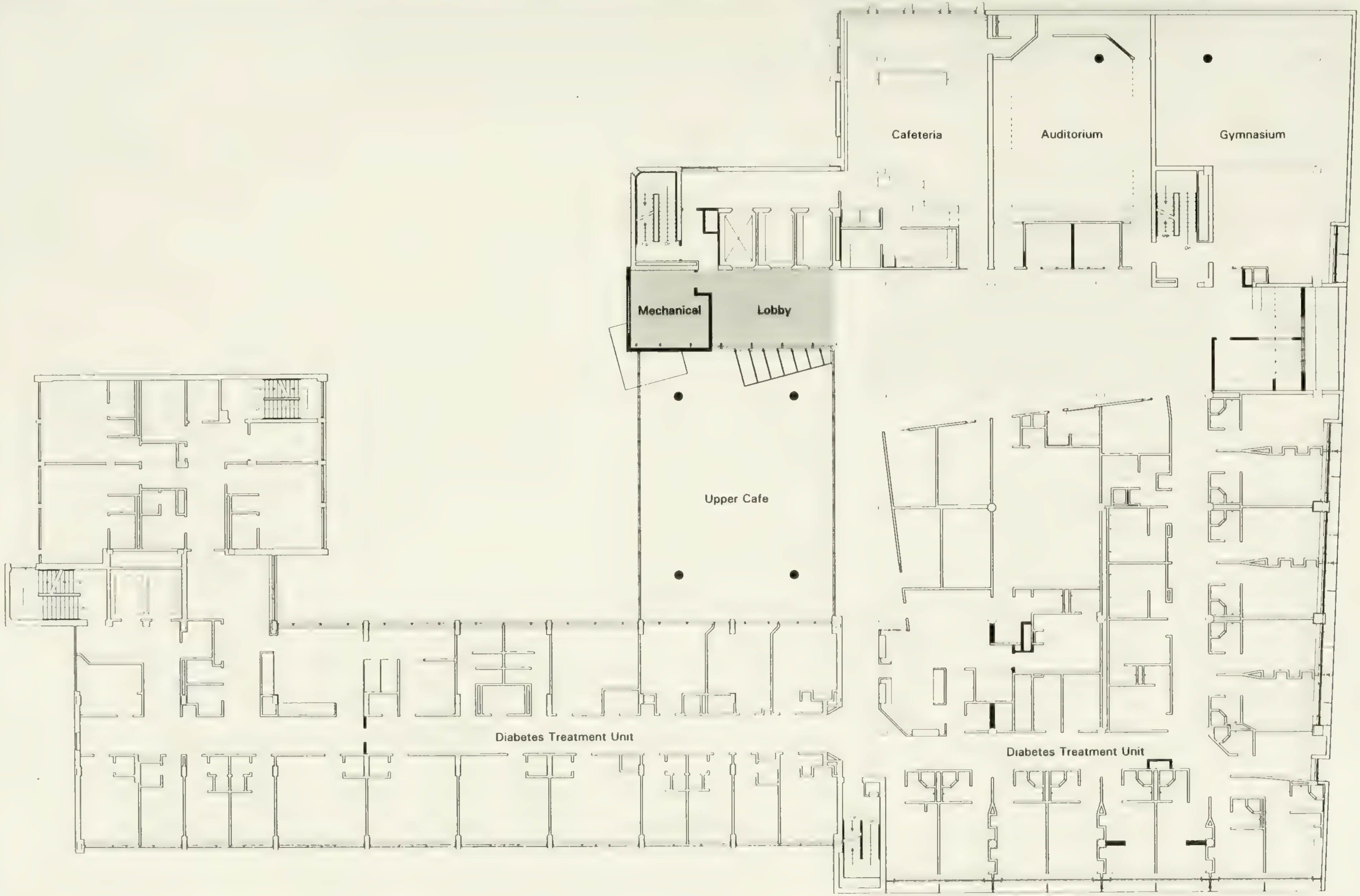
Notes.

NEW CONSTRUCTION
EXISTING PARTITIONS
FUTURE PARTITIONS
FURNITURE (N.I.C.)

Job Number 28913.00
Drawn By
Checked By
Date
Scale 1/8" = 1'-0"
Revised
File 91350.03

SECOND FLOOR
PLAN

A1.3



Joslin Diabetes Center:
Research and Clinic
Facility Expansion

Elenzweig Associates Inc
Architects
1280 Massachusetts Avenue
Cambridge Mass 02138
617 491 5575

LeMessurier Consultants
Structural Engineer
1033 Massachusetts Avenue
Cambridge Mass 02238
617 868 1200

BR+A Consulting Engineers
Mechanical/Electrical Engineer
1320 Soldiers Field Road
Boston Mass 02135
617 254 0618

Robert W. Sullivan Inc
Plumbing and Fire Protection Eng
Unit 302 Union Wharf
Boston Mass 02109
617 523 8227

Vanasse Hangen Brustlin Inc
Traffic Consultant
101 Walnut Street
Watertown Mass 02172
617 924 1770

Lerch Bates & Associates Inc
Elevator Consultant
885 Main Street
Norwell Mass 02061
617 659 1515

Notes

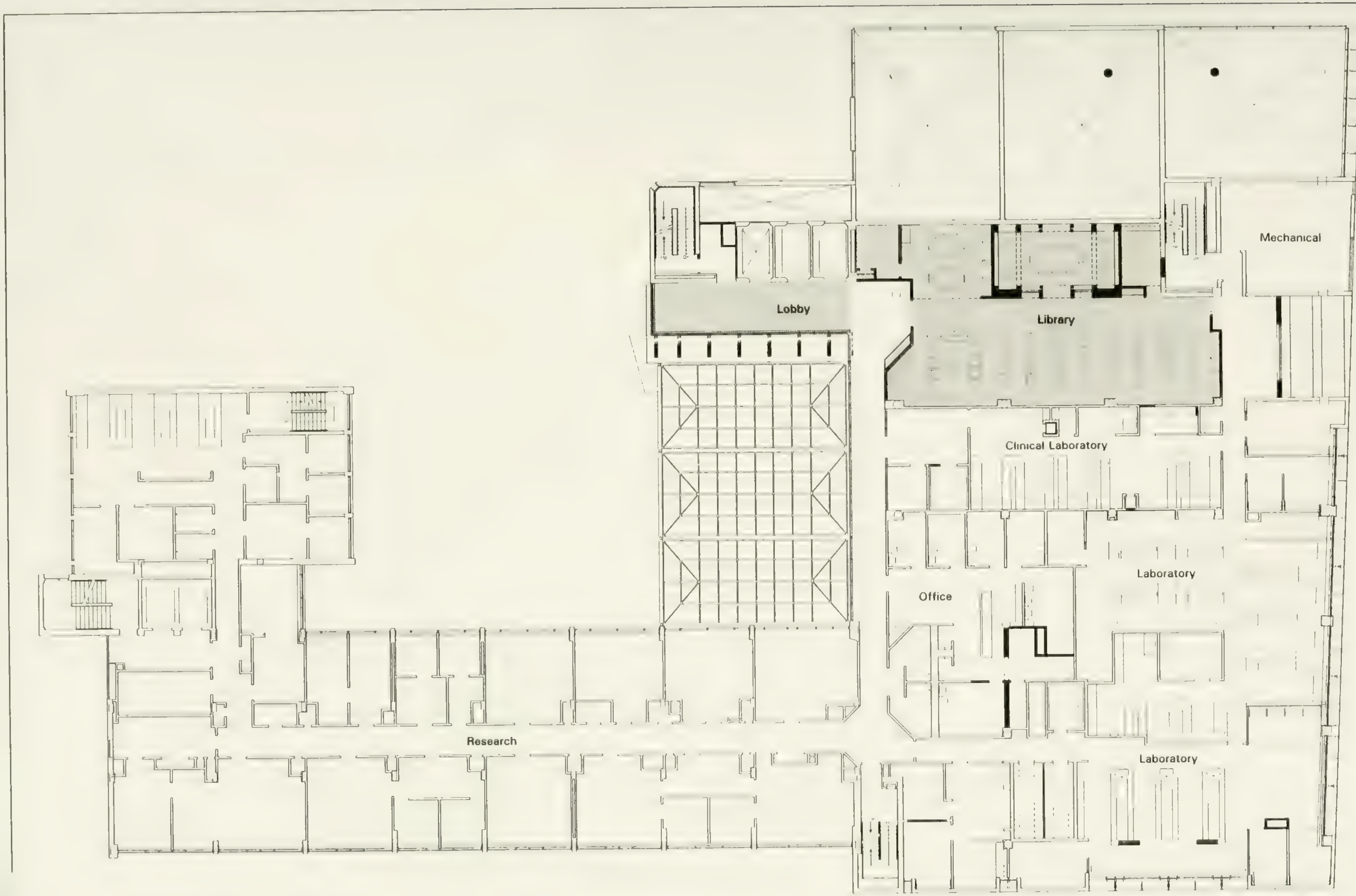
NEW CONSTRUCTION
EXISTING PARTITIONS
FUTURE PARTITIONS
FURNITURE (N.I.C.)

Job Number	28913.00
Drawn By	BH
Checked By	
Date	1 FEBRUARY 1991
Scale	1/8" = 1'-0"
Revised	
File	91350104

PROJECT NORTH

THIRD FLOOR PLAN

A1.4



Joslin Diabetes Center:

Research and Clinic
Facility Expansion

Ellenzweig Associates Inc
Architects
1280 Massachusetts Avenue
Cambridge Mass 02138
617 491 5575

LeMessurier Consultants
Structural Engineer
1033 Massachusetts Avenue
Cambridge Mass 02138
617 868 1200

BR+A Consulting Engineers
Mechanical/Electrical Engineer
1320 Soldiers Field Road
Boston Mass 02135
617 254 1016

Robert W Sullivan Inc
Plumbing and Fire Protection Eng
Unit 302 Union Wharf
Boston Mass 02109
617 523 8227

Vanasse Hangen Brustlin Inc
Traffic Consultant
101 Walnut Street
Watertown Mass 02172
617 924 1770

Lerch Bates & Associates Inc
Elevator Consultant
883 Main Street
Norwell Mass 02061
617 659 1515

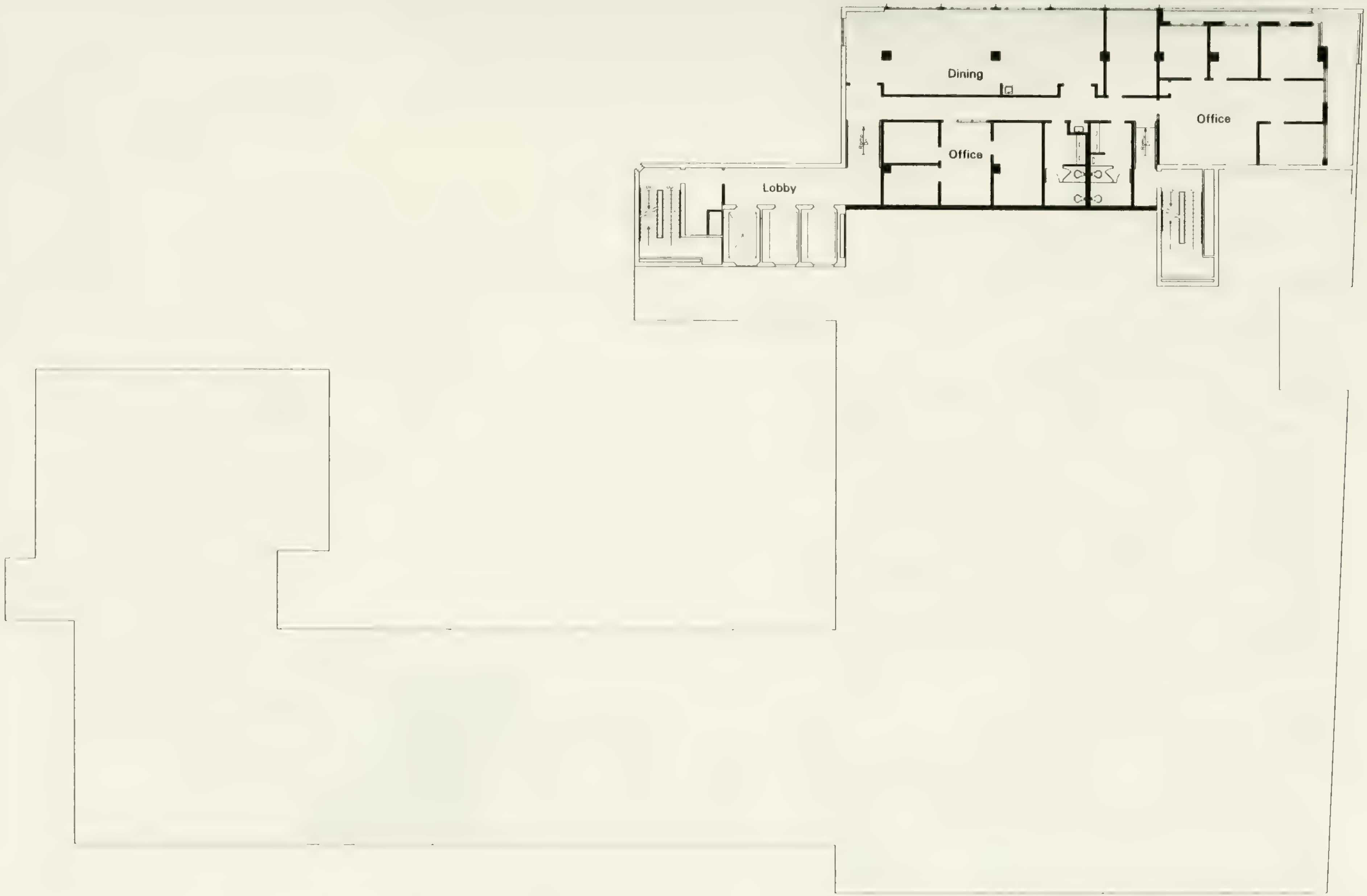
Notes.

NEW CONSTRUCTION
EXISTING PARTITIONS
FUTURE PARTITIONS
FURNITURE (N.I.C.)

Job Number	2891500
Drawn By	BH
Checked By	
Date	1 FEBRUARY 1991
Scale	1/8"=1'-0"
Revised	
File	91350105

FOURTH FLOOR
PLAN

A1.5



Joslin Diabetes Center:

Research and Clinic
Facility Expansion

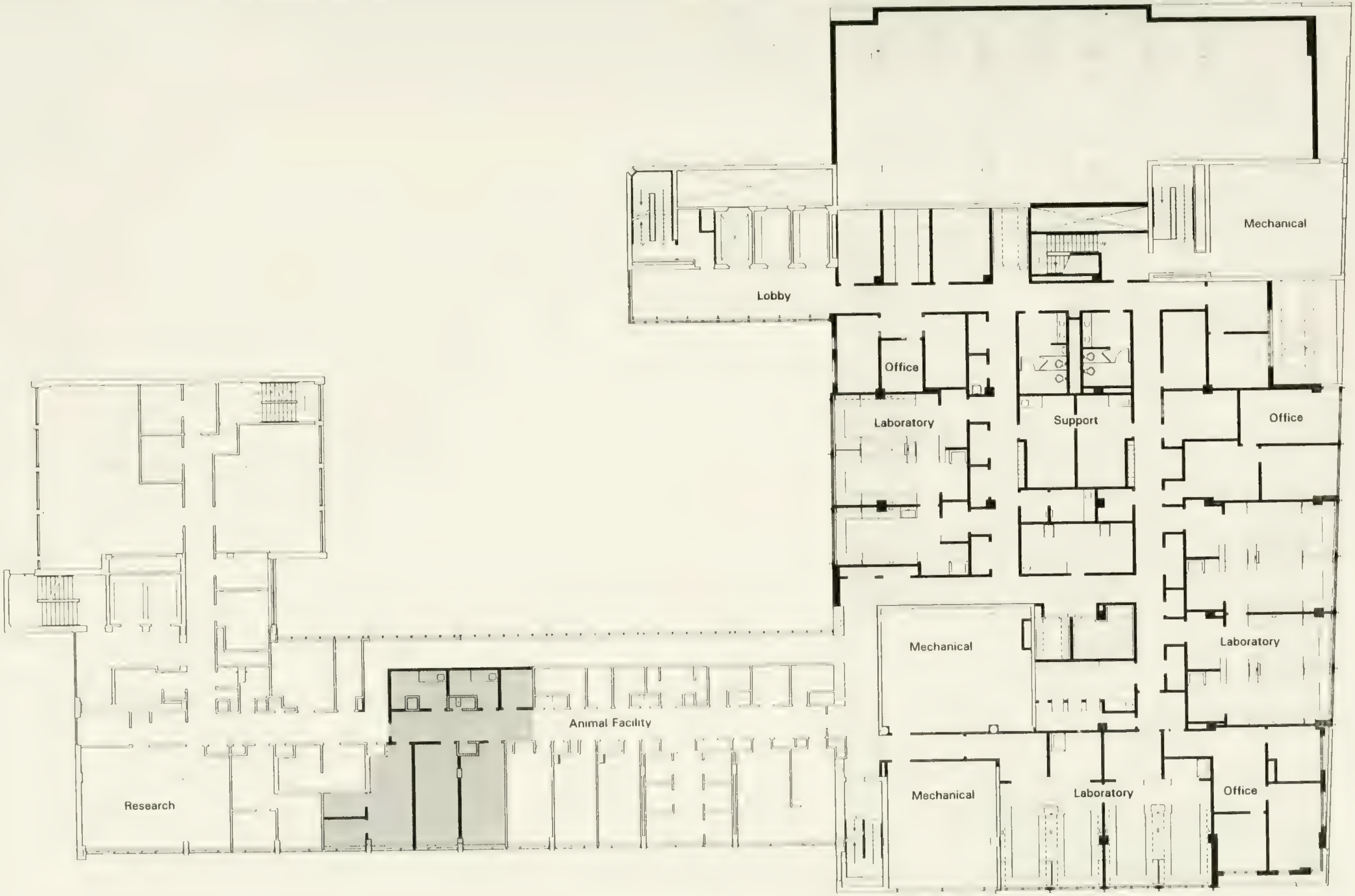
Notes

NEW CONSTRUCTION
EXISTING PARTITIONS
FUTURE PARTITIONS
FURNITURE (NIC)

Job Number	28913.00
Drawn By	BH
Checked By	
Date	1 FEBRUARY 1991
Scale	1/8" = 0"
Revised	
File	91350106

FOUR 1/2 FLOOR PLAN

A1.6



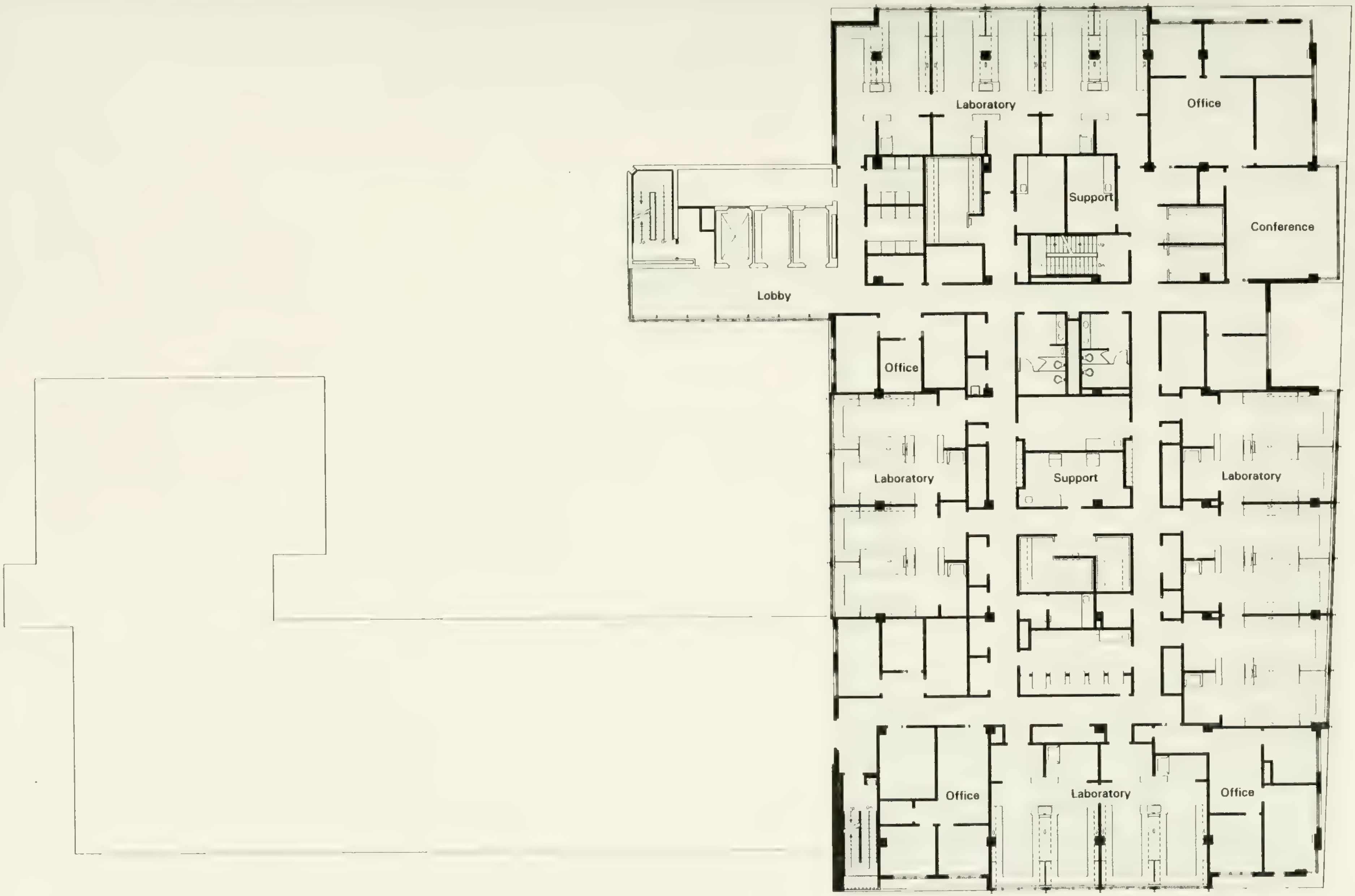
Joslin Diabetes Center:

Research and Clinic
Facility Expansion

Notes.

FIFTH FLOOR
PLAN

A1.7



Joslin Diabetes Center:
Research and Clinic
Facility Expansion

Ellenzweig Associates, Inc
Architects
1280 Massachusetts Avenue
Cambridge Mass 02138
617 491 5575

LeMessurier Consultants
Structural Engineer
1033 Massachusetts Avenue
Cambridge Mass 02238
617 868 1200

BR+A Consulting Engineers
Mechanical/Electrical Engineer
1320 Soldiers Field Road
Boston Mass 02135
617 254 0016

Robert W Sullivan Inc
Plumbing and Fire Protection Eng
Unit 302 Union Wharf
Boston Mass 02109
617 523 8227

Vanasse Hangen Brustlin Inc
Traffic Consultant
101 Walnut Street
Watertown Mass 02172
617 924 1770

Lerch Bates & Associates Inc
Elevator Consultant
683 Main Street
Norwell Mass 02061
617 659 1515

Notes:

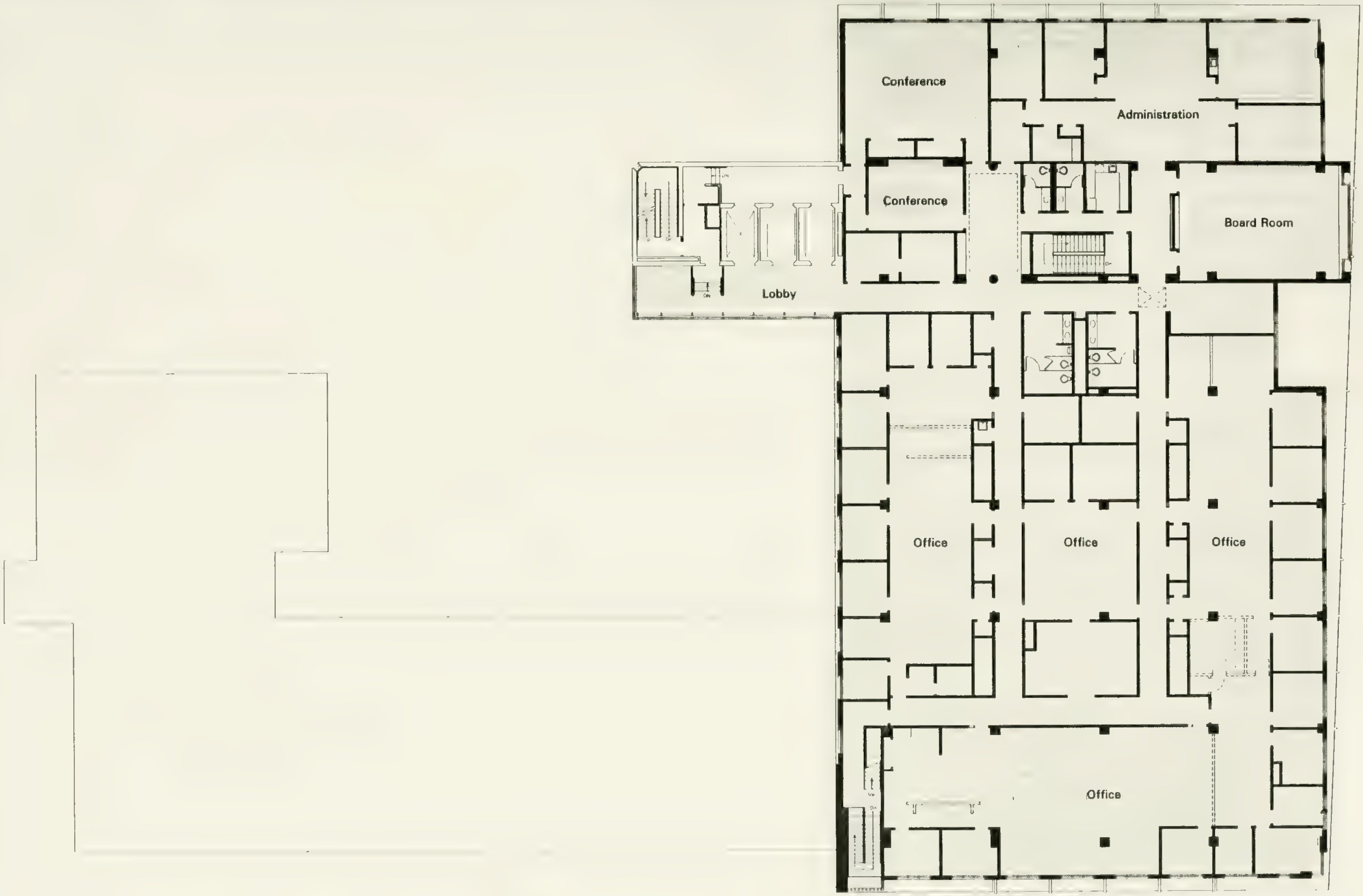
NEW CONSTRUCTION
EXISTING PARTITIONS
FUTURE PARTITIONS
FURNITURE (N I C)

Job Number	2891300
Drawn By	BH
Checked By	
Date	1 FEBRUARY 1991
Scale	1/8" = 1' 0"
Revised	
File	91360108

PROJECT NORTH

SIXTH FLOOR PLAN

A1.8



Joslin Diabetes Center:
Research and Clinic
Facility Expansion

Ellenzweig Associates Inc
Architects
1280 Massachusetts Avenue
Cambridge Mass 02138
617 491 5575

LeMessurier Consultants
Structural Engineer
1033 Massachusetts Avenue
Cambridge Mass 02238
617 868 1200

BR+A Consulting Engineers
Mechanical/Electrical Engineer
1120 Soldiers Field Road
Boston Mass 02135
617 254 0016

Robert W. Sullivan Inc
Plumbing and Fire Protection Eng
Unit 502 Union Wharf
Boston Mass 02109
617 523 8227

Vanasse Hangen Brustlin Inc
Traffic Consultant
101 Walnut Street
Watertown Mass 02172
617 924 1770

Lerch Bates & Associates Inc
Elevator Consultant
883 Main Street
Norwell Mass 02161
617 659 1515

Notes

NEW CONSTRUCTION
EXISTING PARTITIONS
FUTURE PARTITIONS
FURNITURE (N.I.C.)

Job Number	2891300
Drawn By	BH
Checked By	
Date	FEBRUARY 1991
Scale	1/8" = 1' 0"
Revised	
File	91350103

SEVENTH FLOOR PLAN

A1.9

Joslin Diabetes Center:
Research and Clinic
Facility Expansion

Elenzweig Associates, Inc
Architects
1280 Massachusetts Avenue
Cambridge Mass 02138
617-491 5575

LeMessurier Consultants
Structural Engineer
1033 Massachusetts Avenue
Cambridge Mass 02238
617 868 1200

BR+A Consulting Engineers
Mechanical/Electrical Engineer
1320 Soldiers Field Road
Boston Mass 02135
617-254 0016

Robert W Sullivan Inc
Plumbing and Fire Protection Eng
Unit 302 Union Wharf
Boston Mass 02109
617 523 8227

Vanasse Hangen Brustlin Inc
Traffic Consultant
101 Walnut Street
Watertown Mass 02172
617 924 1770

Lerch, Bates & Associates, Inc
Elevator Consultant
883 Main Street
Norwell Mass 02061
617 659-1515

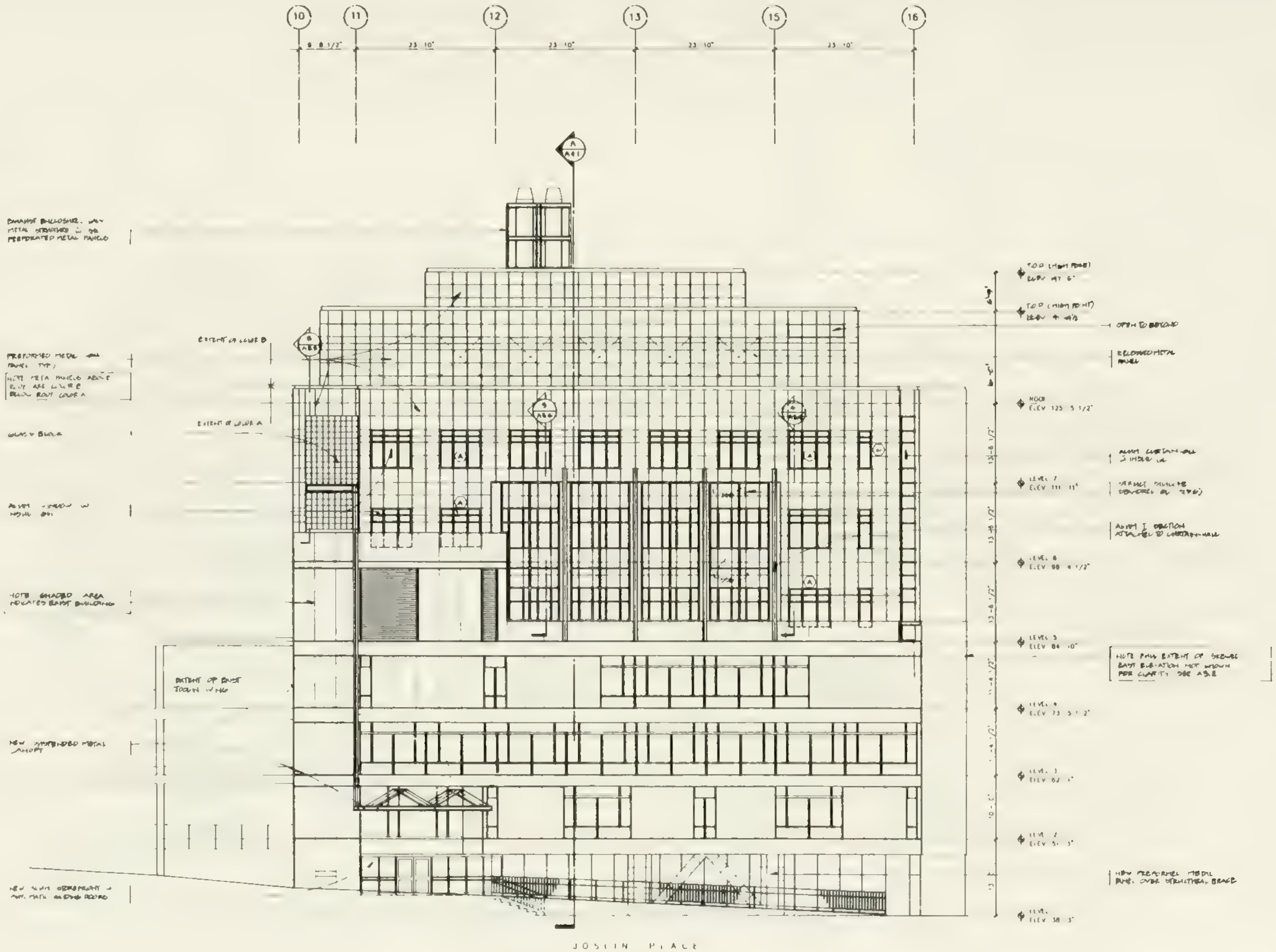
Notes

Job Number	28913.00
Drawn By	BH
Checked By	
Date	1 FEBRUARY 1991
Scale	1/8"=1' 0"
Revised	
File	91350111

PROJECT NORTH

UPPER
ROOF PLAN

A1.11

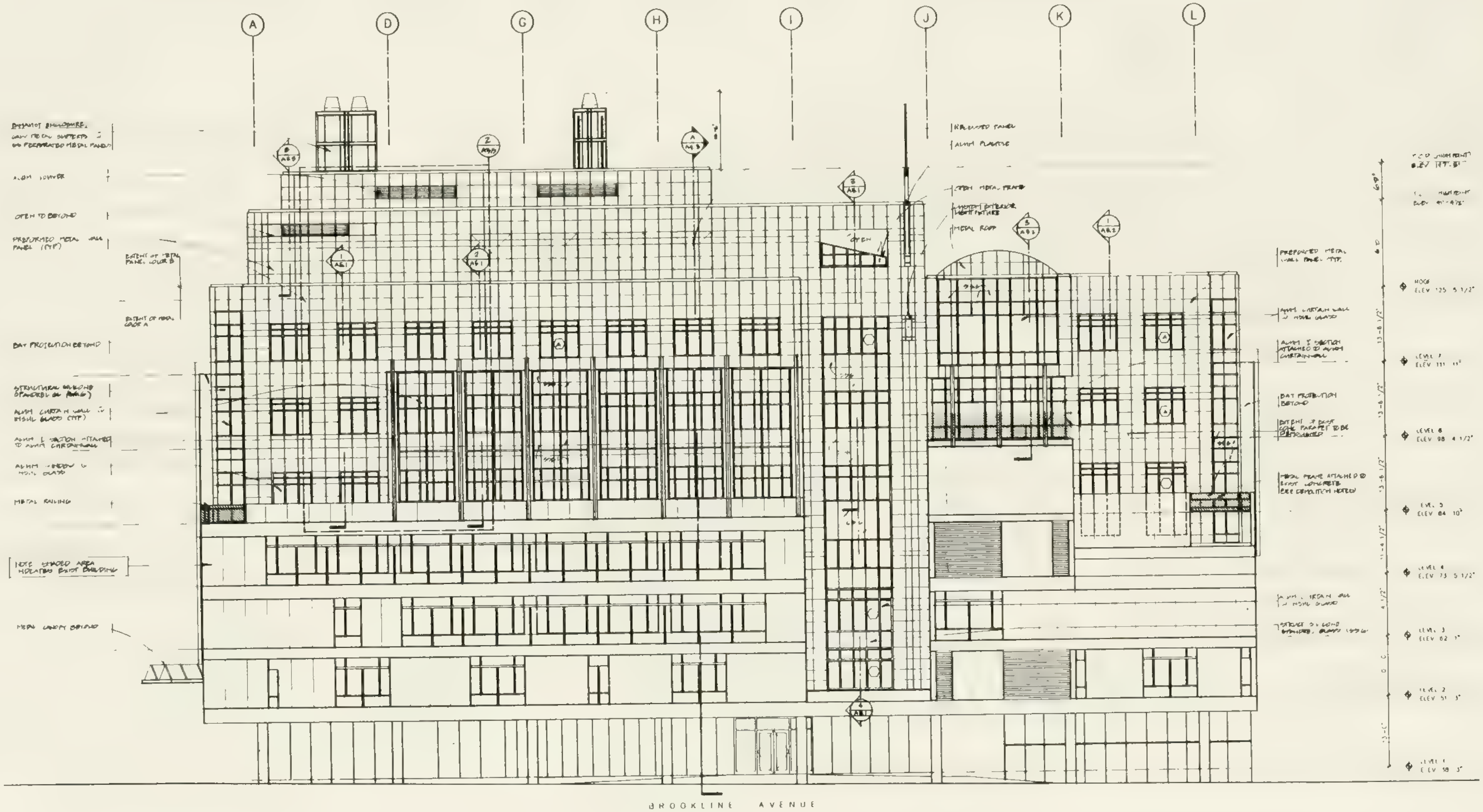


Joslin Diabetes Center: Research and Clinic Facility Expansion	Ellenzweig Associates, Inc Architects 1280 Massachusetts Avenue Cambridge Mass 02138 617-491-5575 LeMessurier Consultants Structural Engineer 1033 Massachusetts Avenue Cambridge, Mass. 02238 617 868 1200 BR+A Consulting Engineers Mechanical/Electrical Engineer 1320 Soldiers Field Road Boston Mass 02135 617 254-0016	Robert W. Sullivan, Inc Plumbing and Fire Protection Eng. Unit 302 Union Wharf Boston Mass 02109 617 523 8227 Vanasse, Hangen, Brustlin, Inc Traffic Consultant 101 Walnut Street Watertown Mass 02172 617-924-1770 Lerch, Bates & Associates, Inc Elevator Consultant 883 Main Street Norwell Mass 02061 617-659-1515	Notes:

Job Number	28913.00
Drawn By	
Checked By	
Date	
Scale	1/8"=1' 0"
Revised	
File	81450301

SOUTH ELEVATION

A3.1



Joslin Diabetes Center:
Research and Clinic
Facility Expansion

Ellenzweig Associates, Inc
Architects
1280 Massachusetts Avenue
Cambridge Mass. 02138
617-491-5575

LeMessurier Consultants
Structural Engineer
1033 Massachusetts Avenue
Cambridge, Mass. 02238
617-868-1200

BR+A Consulting Engineers
Mechanical/Electrical Engineer
1320 Soldiers Field Road
Boston, Mass. 02135
617-254-0016

Robert W. Sullivan, Inc.
Plumbing and Fire Protection Eng.
Unit 302, Union Wharf
Boston, Mass. 02109
617-523-8227

Vanasse, Hangen, Brustlin, Inc.
Traffic Consultant
101 Walnut Street
Watertown, Mass. 02172
617-924-1770

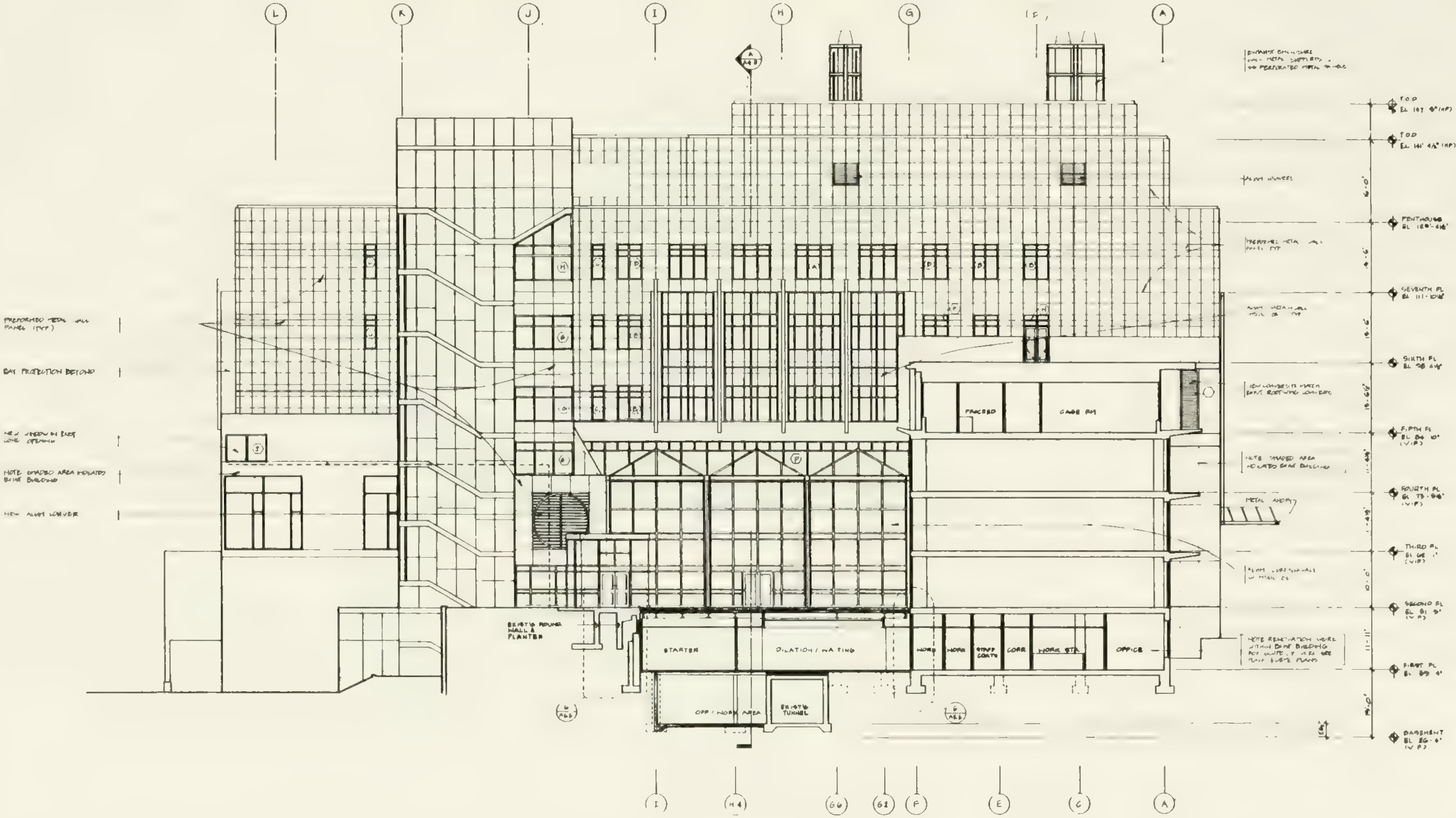
Lerch, Bates & Associates, Inc.
Elevator Consultant
683 Main Street
Norwell, Mass. 02061
617 659-1515

Notes:

Job Number	28913.00
Drawn By	ML
Checked By	
Date	1 FEB 91
Scale	1/8"=1'-0"
Revised	
File	91350302

EAST ELEVATION

A3.2



Joslin Diabetes Center:

Research and Clinic
Facility Expansion

Ellenzweig Associates, Inc
Architects
1280 Massachusetts Avenue
Cambridge Mass. 02138
817 491 5575

LeMessurier Consultants
Structural Engineer
1033 Massachusetts Avenue
Cambridge, Mass. 02238
617 868-1200

BR+A Consulting Engineers
Mechanical/Electrical Engineer
1320 Soldiers Field Road
Boston, Mass. 02135
617-254-0016

Robert W. Sullivan, Inc.
Plumbing and Fire Protection Eng.
Unit 302, Union Wharf
Boston Mass. 02109
617 523-8227

Vanasse, Hangen, Brustlin, Inc.
Traffic Consultant
101 Walnut Street
Watertown, Mass. 02172
617 924-1770

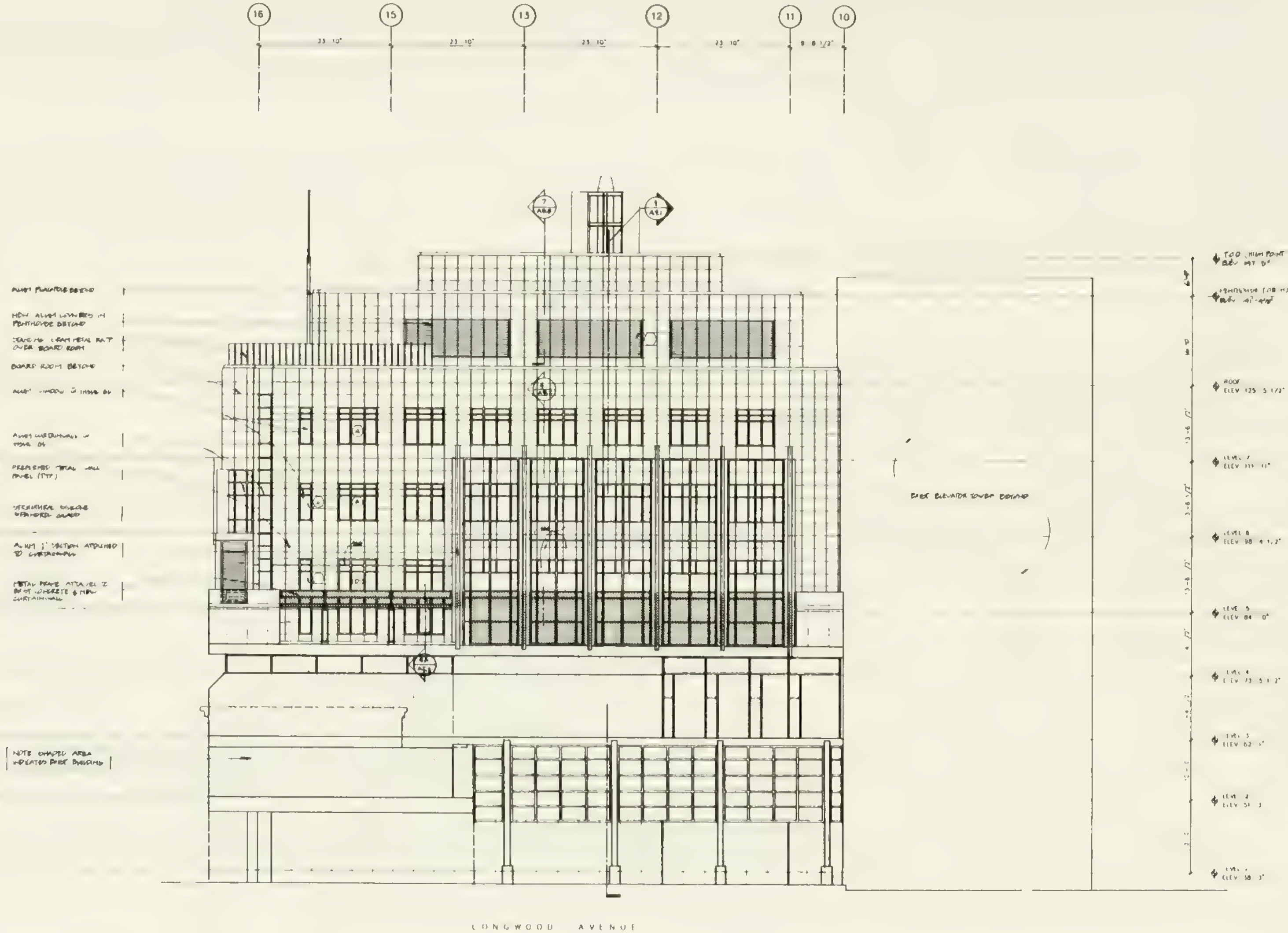
Lerch, Bates & Associates, Inc.
Elevator Consultant
663 Main Street
Norwell, Mass. 02061
617-659-1515

Notes:
1 CONTRACTOR TO VERIFY ALL DIMENSIONS IN FIELD

Job Number	28913.00
Drawn By	HC TL
Checked By	
Date	1 FEB 1991
Scale	1/8" = 1'-0"
Revised	
File	

WEST
ELEVATION

A3-3



Joslin Diabetes Center:

Research and Clinic
Facility Expansion

Ellenzweig Associates, Inc
Architects
1280 Massachusetts Avenue
Cambridge Mass. 02138
617 491-5575

LeMessurier Consultants
Structural Engineer
1033 Massachusetts Avenue
Cambridge Mass. 02238
617 868 1200

BR+A Consulting Engineers
Mechanical/Electrical Engineer
1320 Soldiers Field Road
Boston Mass. 02135
617 254 0016

Robert W. Sullivan Inc
Plumbing and Fire Protection Eng.
Unit 302 Union Wharf
Boston Mass. 02109
617 523 8227

Vanasse, Hangen, Brustlin, Inc.
Traffic Consultant
101 Walnut Street
Watertown Mass. 02172
617 924-1770

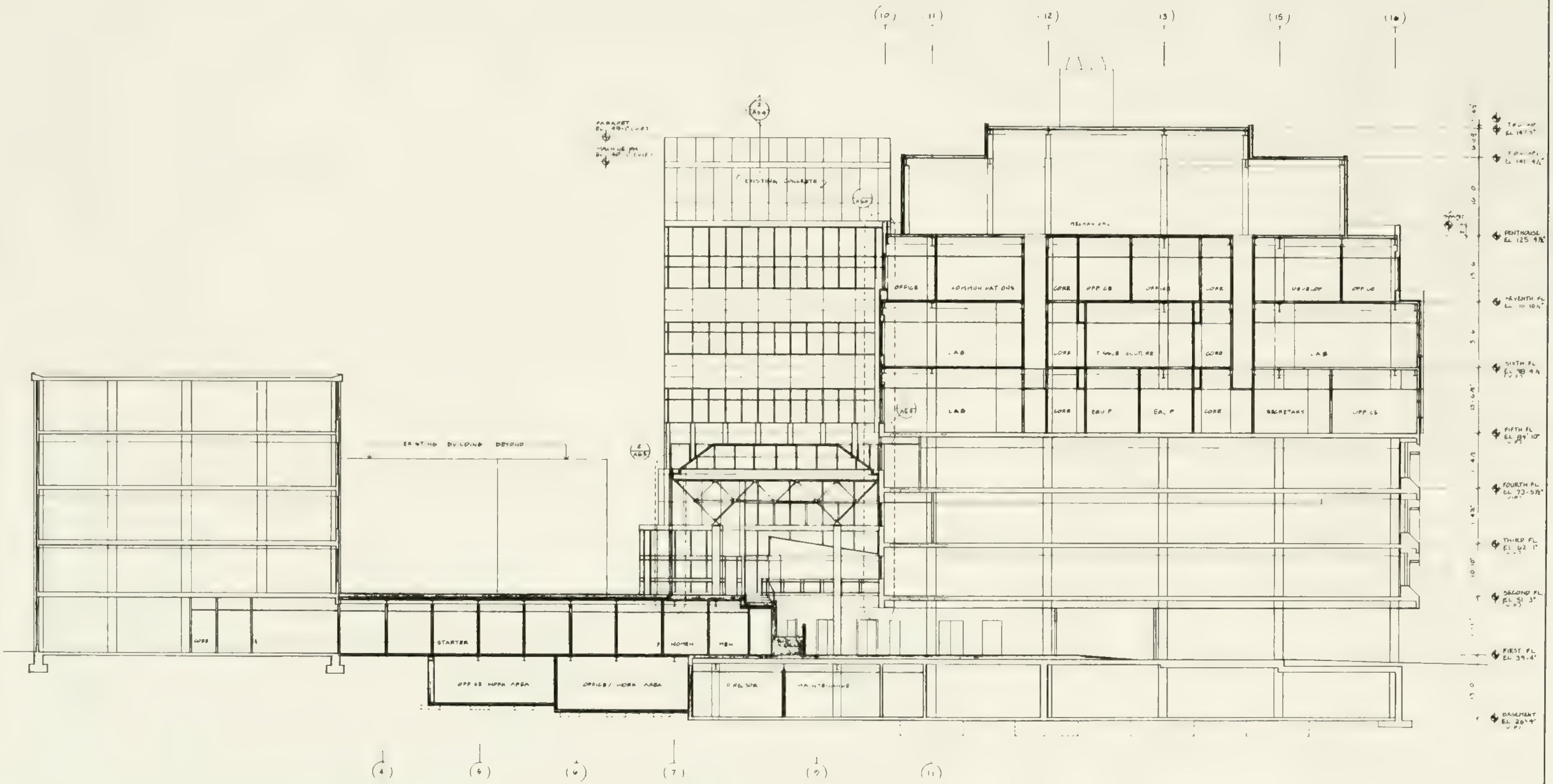
Lerch, Bates & Associates Inc.
Elevator Consultant
683 Main Street
Norwell Mass. 02061
617-659-1515

Notes:

Job Number	28913.00
Drawn By	MG
Checked By	
Date	1 FEB 1991
Scale	1/8" = 1' 0"
Revised	
File	91350304

NORTH ELEVATION

A3.4



Joslin Diabetes Center:

Research and Clinic
Facility Expansion

Ellenzweig Associates, Inc
Architects
1280 Massachusetts Avenue
Cambridge Mass. 02138
617 491-5575

LeMessurier Consultants
Structural Engineer
1033 Massachusetts Avenue
Cambridge Mass. 02238
617-868 1200

BR+A Consulting Engineers
Mechanical/Electrical Engineer
1320 Soldiers Field Road
Boston Mass. 02135
617-254-0016

Robert W. Sullivan, Inc
Plumbing and Fire Protection Eng.
Unit 302 Union Wharf
Boston Mass. 02109
617 523 8227

Vanasse, Hangen, Brustlin, Inc.
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101 Walnut Street
Watertown Mass. 02172
617 924 1770

Lerch, Bates & Associates, Inc.
Elevator Consultant
883 Main Street
Norwell Mass. 02061
617-659-1515

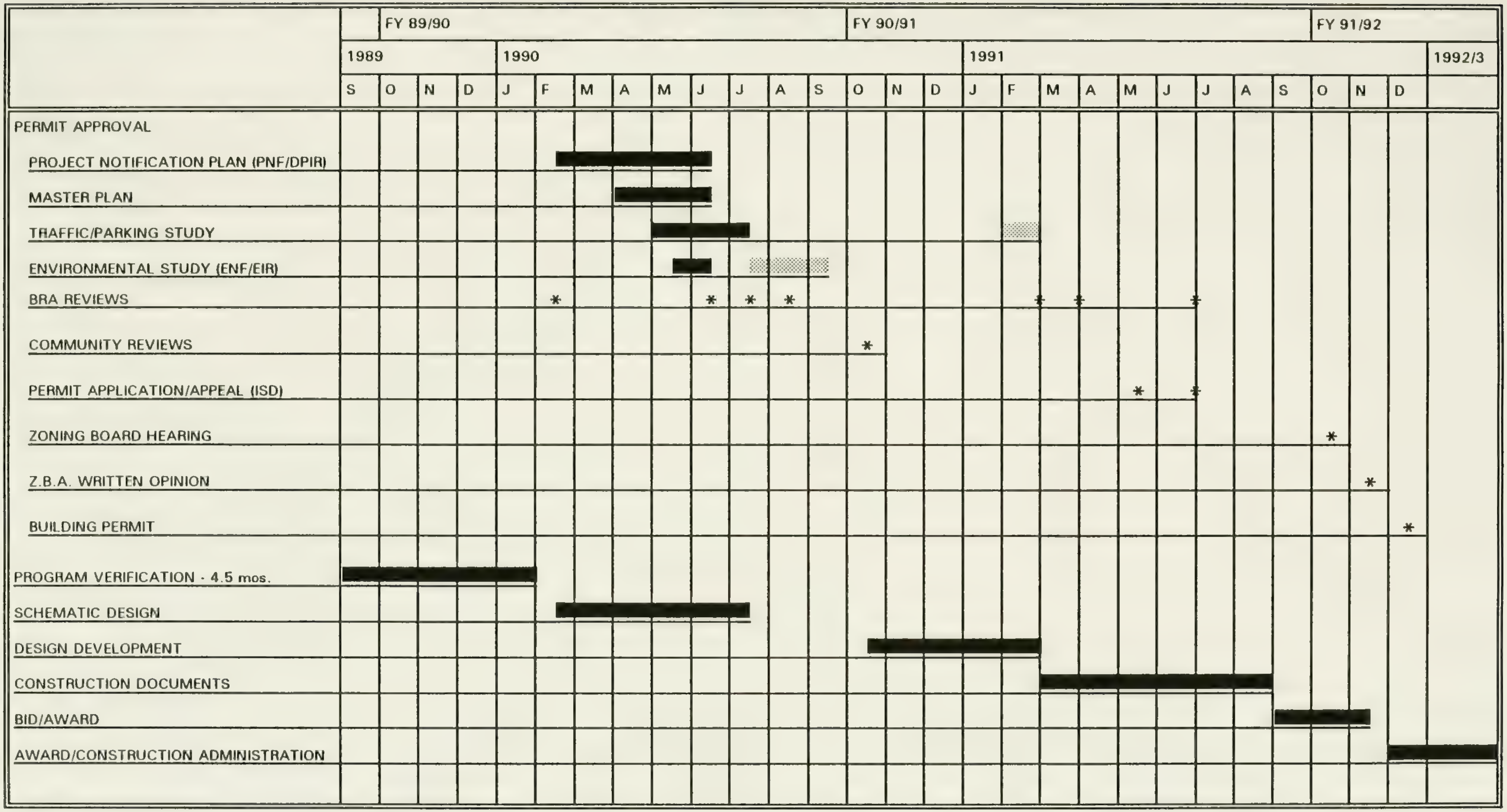
Notes:
1 CONTRACTOR TO VERIFY ALL DIMENSIONS IN FIELD

Job Number	28913.00
Drawn By	BB TL
Checked By	
Date	1 FEB 1991
Scale	
Revised	
File	

BUILDING SECTION

A-4.3

A bar chart project schedule showing phases already completed and anticipated dates of future phases is presented on the following pages.


FY 89/90
FY 90/91
FY 91/92
1989
1990
1991
1992/3
S O N D J F M A M J J A S O N D J F M A M J J A S O N D
PERMIT APPROVAL
PROJECT NOTIFICATION PLAN (PNF/DPIR)
MASTER PLAN
TRAFFIC/PARKING STUDY
ENVIRONMENTAL STUDY (ENF/EIR)
BRA REVIEWS
COMMUNITY REVIEWS
PERMIT APPLICATION/APPEAL (ISD)
ZONING BOARD HEARING
Z.B.A. WRITTEN OPINION
BUILDING PERMIT
PROGRAM VERIFICATION - 4.5 mos.
SCHEMATIC DESIGN
DESIGN DEVELOPMENT
CONSTRUCTION DOCUMENTS
BID/AWARD
AWARD/CONSTRUCTION ADMINISTRATION

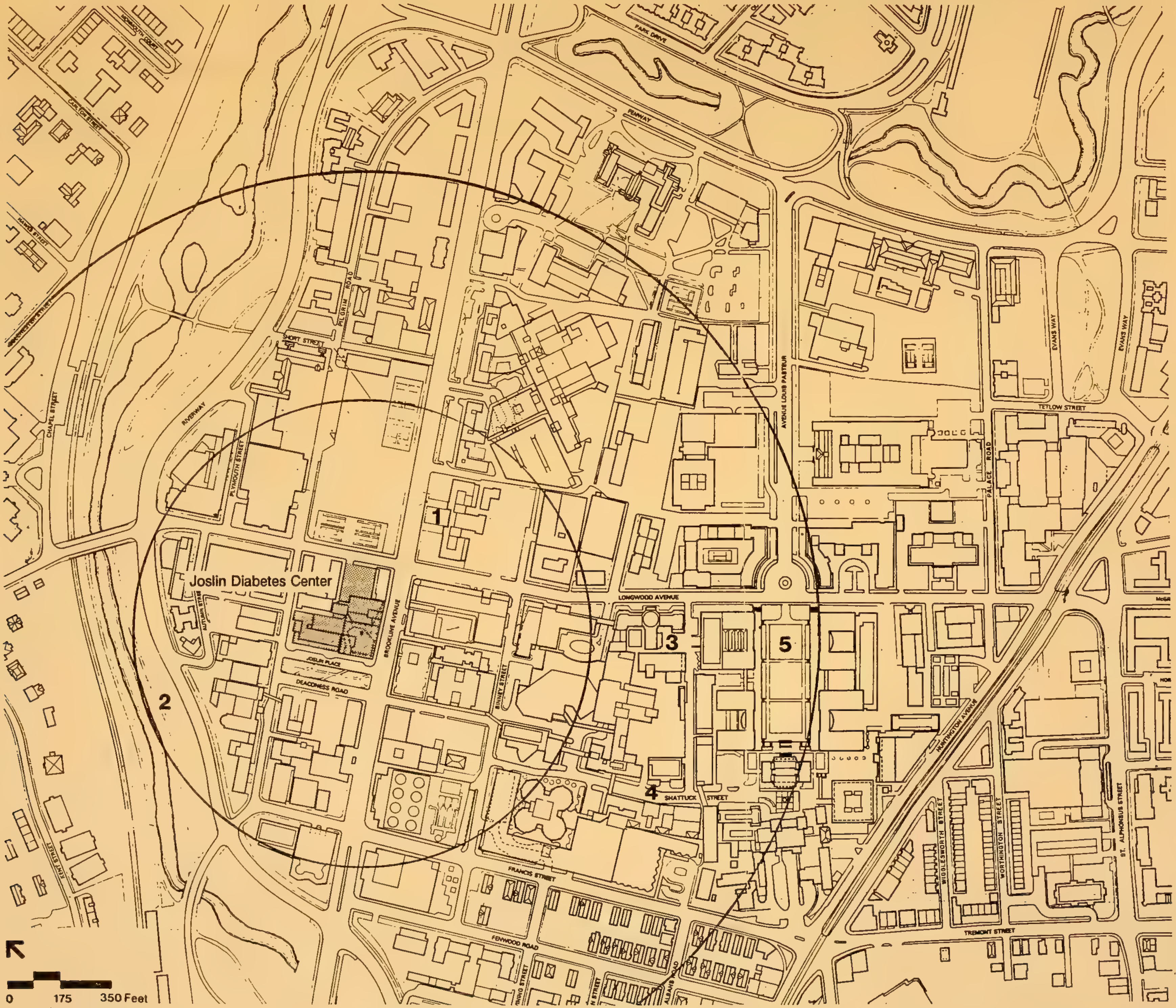
Historic Resources Component

E

The Joslin Diabetes Center Research and Clinic Facility Expansion will include the construction of new space on top of the existing Howard F. Root Wing. The Root Wing, completed in 1976, provides research and clinical space to supplement the original Joslin Building which was constructed in 1956. Both structures are representative of the Modern Style. The proposed project has been designed to respond to and complement the architecture of the existing Joslin Diabetes Center buildings. It is this context to which the new addition will most strongly relate with respect to massing, scale and materials. No disturbance of archaeological resources is expected due to the very small extent of excavation required to construct the project.

Several buildings in the Longwood Medical area are noted in the Boston Landmarks Commission's 1983 Survey and Planning Grant Fenway Project Completion Report. This report documents both buildings and areas already designated with landmark status and those recommended for designation. The area map on the following page shows the Joslin Diabetes Center and the surrounding area. Note that the only buildings or areas within a 750 foot radius cited in the Boston Landmarks Commission Report are the Massachusetts College of Art Building (364 Brookline Avenue, listed on National Register of Historic Places and pending Boston Landmark designation) and the portion of the Emerald Necklace (listed on National Register and Designated Boston Landmarks) which consists of the Muddy River and surrounding park running to the southwest of the Joslin Buildings. Further away, Children's Hospital's original administration building (recommended for National Register and Boston Landmark Designation), the Rotch Memorial Hospital for Infants (Recommended for National Register), and The Harvard Medical School District (Recommended for National Register/Landmark District Designation) are all within 1500 feet. The Joslin Diabetes Center site itself is not mentioned in the Fenway Project Completion Report, nor is it recommended for city landmark designation or inclusion in the National Register or State Register of Historic Places.

The Boston Landmarks Commission staff (Mr. Michael Cannizzo and Ms. Carol Huggins) has reviewed the Joslin Project's proximity to designated and recommended properties and has also reviewed the shadow studies presented in section C1 of this report. The Boston Landmarks Commission concurs that no adverse impact to any historic buildings or districts is anticipated due to the proposed additions.



1. Massachusetts College of Art
2. Emerald Necklace
3. Children's Hospital
4. Rotch Memorial Hospital for Infants
5. Harvard Medical School District

Ellenzweig Associates, Inc.
Architects

1280 Massachusetts Avenue
Cambridge, Massachusetts 02138
617-491-5575 Fax 617-868-2318

FIGURE 1
Historic Resource Area Map

A brief analysis of infra-structure systems impacts is contained in the consultant letters, charts and graphs presented on the following pages. This analysis includes a simple table of energy consumption comparisons (existing vs. proposed), graphs showing those energy consumption comparisons, and a location plan showing existing service connections. It should be noted that heating, steam, chilled water, and electrical power are all supplied to the existing building from the Medical Area Total Energy Plant and that MATEP will continue to supply these services to the proposed project through existing service entries. Existing storm and sewer connections to City of Boston systems will also remain in place and are adequately sized to serve the proposed project. No new service connections (other than future telephone and data) are required.

Infrastructure Systems Component F

Bard, Rao - Athanas Consulting Engineers, Inc.

BR+A

1320
Soldiers Field Road
Boston
Massachusetts
02135
617.254.0016
617.254.9175 Fax

6
East South Street
Hanover
New Hampshire
03755
603.643.6426
603.643.6339 Fax

Reply to Boston Office

(via FAX)

March 4, 1991

Mr. Rob Tullis
Ellenzweig Associates, Inc.
1280 Massachusetts Avenue
Cambridge, Massachusetts 02138

RE: JOSLIN DIABETES CENTER

Dear Rob:

The impact of the new Research and Clinic Facility Expansion upon the infrastructure of the Joslin Diabetes Center pertaining to BR+A are as follows:

HVAC

Heating energy is supplied via a 6" high pressure steam line from MATEP (Medical Area Total Energy Plant). The existing steam supply and condensate return pipe is adequately sized for the additional estimated load.

Cooling energy is also supplied by MATEP. Chilled water is supplied and returned via 10" chilled water mains. The existing mains are adequately sized for the additional estimated load.

ELECTRICAL

Electrical power is supplied via two 13,800 volt, 3 phase lines also from MATEP. This primary service feeds a 1,000 KVA, 13.8 KV to 480/277 volt 3 phase, 4 wire double ended unit substation. The existing transformation is adequate for the additional estimated load provided the Owner does not require redundancy in the transformation (which was confirmed at an earlier design meeting).

Eugene M. Bard
Arjun H. Rao
Theodore Athanas

Gerald L. Edwards
Peter G. Koutrakis
Kevin F. Sherman

Allan E. Ames
John J. Baker
William T. Duross
Philip S. Johnson

Stephen F. MacLean
Louis A. Percoco
Robert T. Saam

If there are any questions or comments on the above, please do not hesitate to contact our office.

Very truly yours,

BARD, RAO + ATHANAS CONSULTING ENGINEERS, INC.

Stephen B. Carroll

Stephen B. Carroll

cc: EMB/ABR/DJC/FILE #90-010

SBC/tp

Robert W. Sullivan, Inc.
Consulting Engineers
Unit 302, Union Wharf
Boston, Massachusetts 02109
(617) 523-8227
(Fax) 523-8016
A. Eugene Sullivan P.E.
Anthony T. DiStefano P.E.
Bahig A. Kaldas P.E.
George H. Minahan
Eugene B. Kingman
Steven P. Quieto

March 4, 1991

Ellenzweig Associates, Inc.
1280 Massachusetts Avenue
Cambridge, MA 02138

ATT: Mr. Robert Tullis

RE: Joslin Diabetes Center #3230

Dear Rob:

Reference is made to BRA paragraph "F" Infrastructure Systems Component regarding the evaluation of the proposed project's impact on the capacity and adequacy of existing utilities for the above project. The following are our comments:

1. Storm Drainage

   Existing 10-inch to Brookline Avenue, 10-inch to Joslin Road and 8-inch to Joslin Road are adequate for the new addition because the area of the site did not change.

2. Sanitary Sewer

   Existing 8-inch sanitary to Brookline Avenue and 6-inch sanitary to Joslin Road are adequate for the new added plumbing fixtures and laboratory sinks in the new addition.

3. Domestic Water

   Existing 6-inch domestic water from Brookline Avenue AND 4" FROM JOSLIN PLACE ~~is~~ ARE adequate for the new added plumbing fixtures and laboratory sinks in the new addition.

4. Fire Protection Water

   Existing 8-inch from Brookline Avenue and 4-inch from Joslin road are adequate for the new addition fire protection system.

If you have any questions, please call us.

Very truly yours,

ROBERT W. SULLIVAN, INC.

Bahig A. Kaldas

BAHIG A. KALDAS

BAK:mjh

RWS

Robert W. Sullivan, Inc.
Consulting Engineers
Unit 302, Union Wharf
Boston, Massachusetts 02109
(617) 523-8227
(Fax) 523-8016

A. Eugene Sullivan P.E.
Anthony T. DiStefano P.E.
Bahig A. Kaldas P.E.
George H. Minahan
Eugene B. Kingman
Steven P. Quieto

RECEIVED
1991
Ellenzweig Associates, Inc.

September 24, 1991

Ellenzweig Associates, Inc.
1280 Massachusetts Avenue
Cambridge, MA 02138

ATT: Mr. Robert Tullis

#3230

RE: Joslin Diabetes Center

Dear Rob:

The Joslin Institutional Master Plan indicates a net increase in occupancy in the above project of 60 persons (20 office workers and 40 laboratory workers). Although the additional space can handle an excess of the anticipated number, the existing building is overcrowded and the additional square footage will allow for decompression of overcrowding.

We estimate the additional sewage flow using 314 CMR Division of Water Pollution, Paragraph 7.15:

20 office workers	@ 10 =	200	gallons per day
40 lab workers	@ 15 =	600	gallons per day

		800	gallons per day

We estimate water consumption = 960 gallons per day.

Additional flow can be handled by existing utilities.

If you have any questions, please call us.

Very truly yours,

ROBERT W. SULLIVAN, INC.

Bahig A. Kaldas

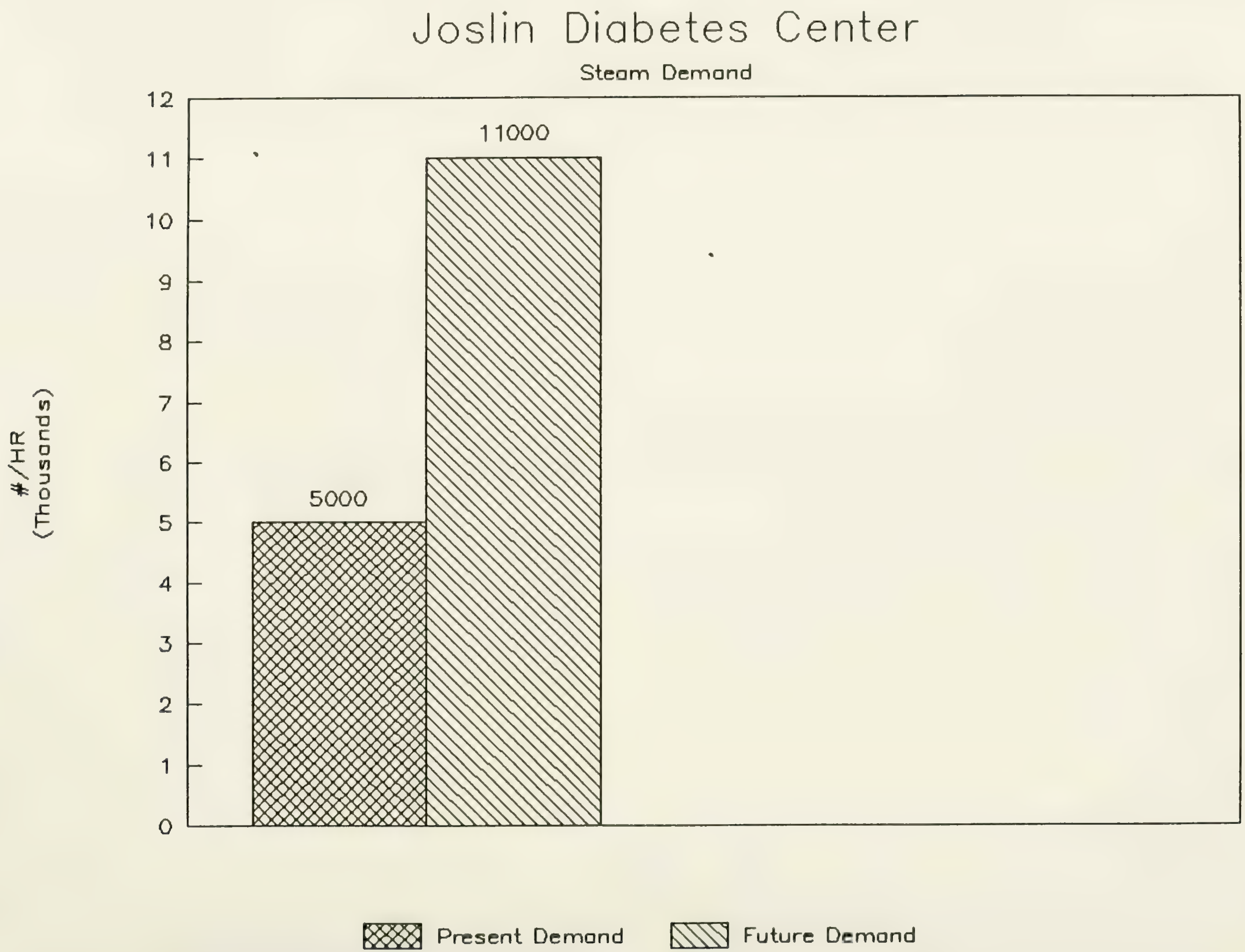
BAHIG A. KALDAS

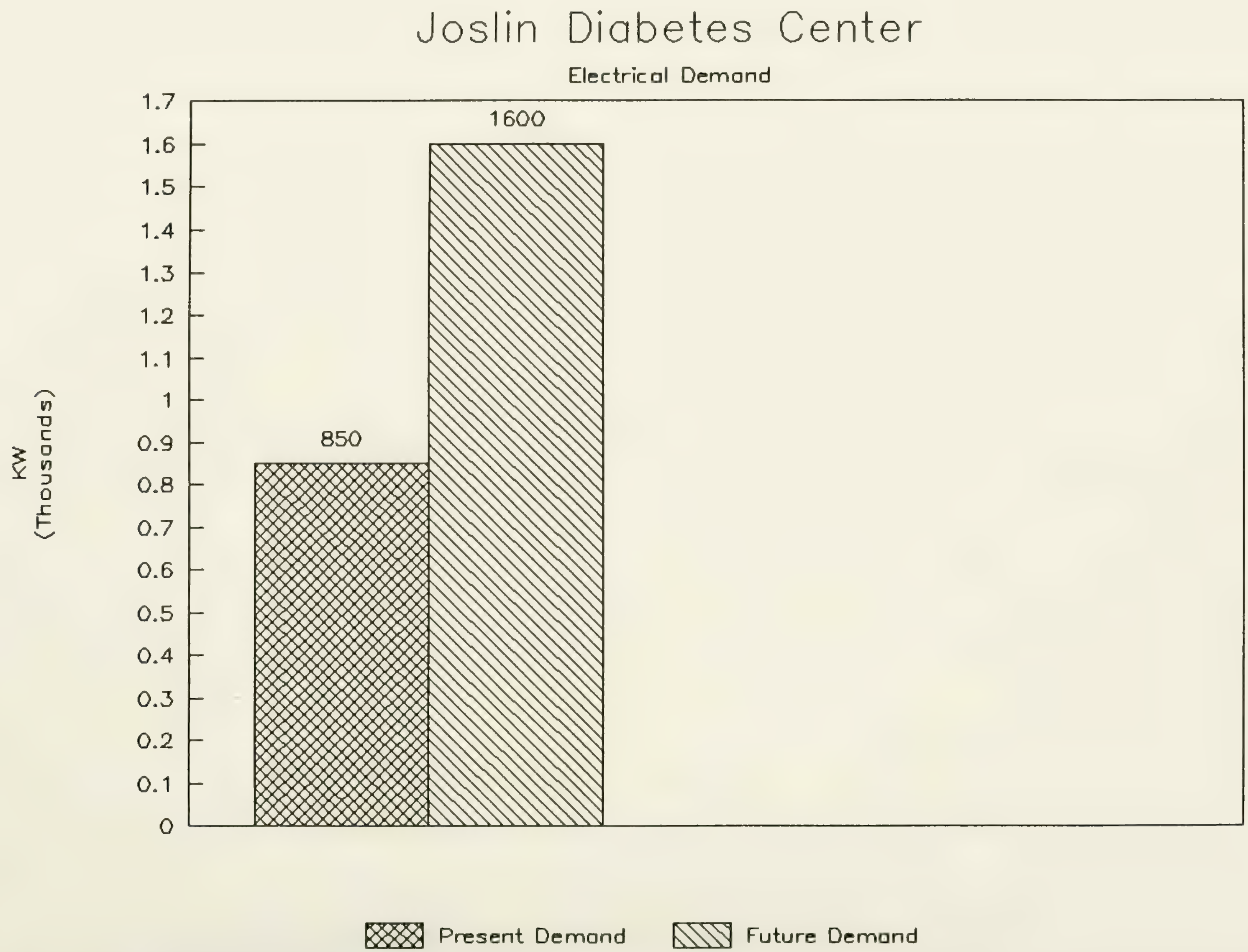
BAK:mjh

P/PM	RT
WORKING COPY	
JOB NAME #	
FILE	

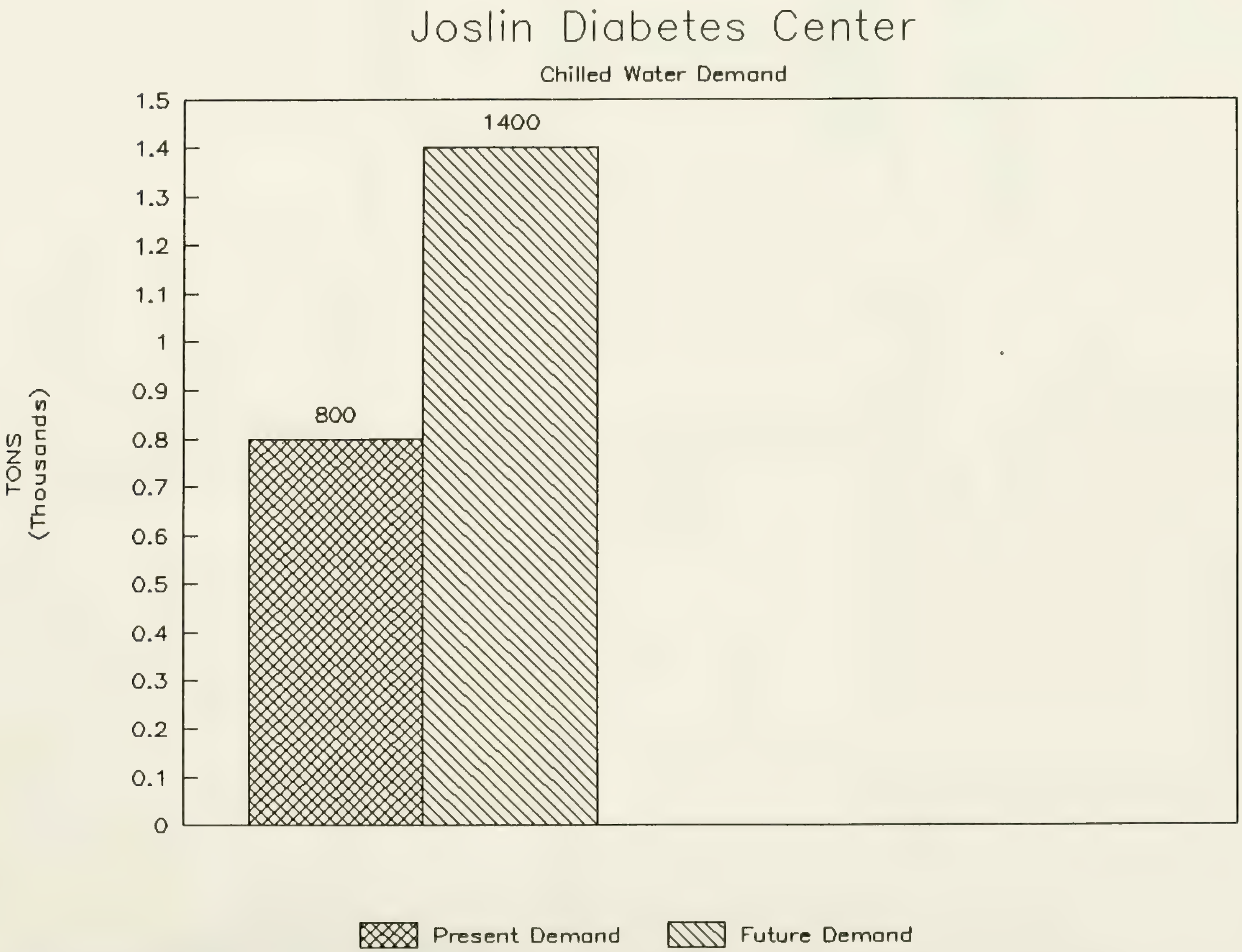
BR+A Consulting Engineers Inc.
September 9, 1991 sbc
Utility Demand Load Comparision
Joslin Diabetes Center

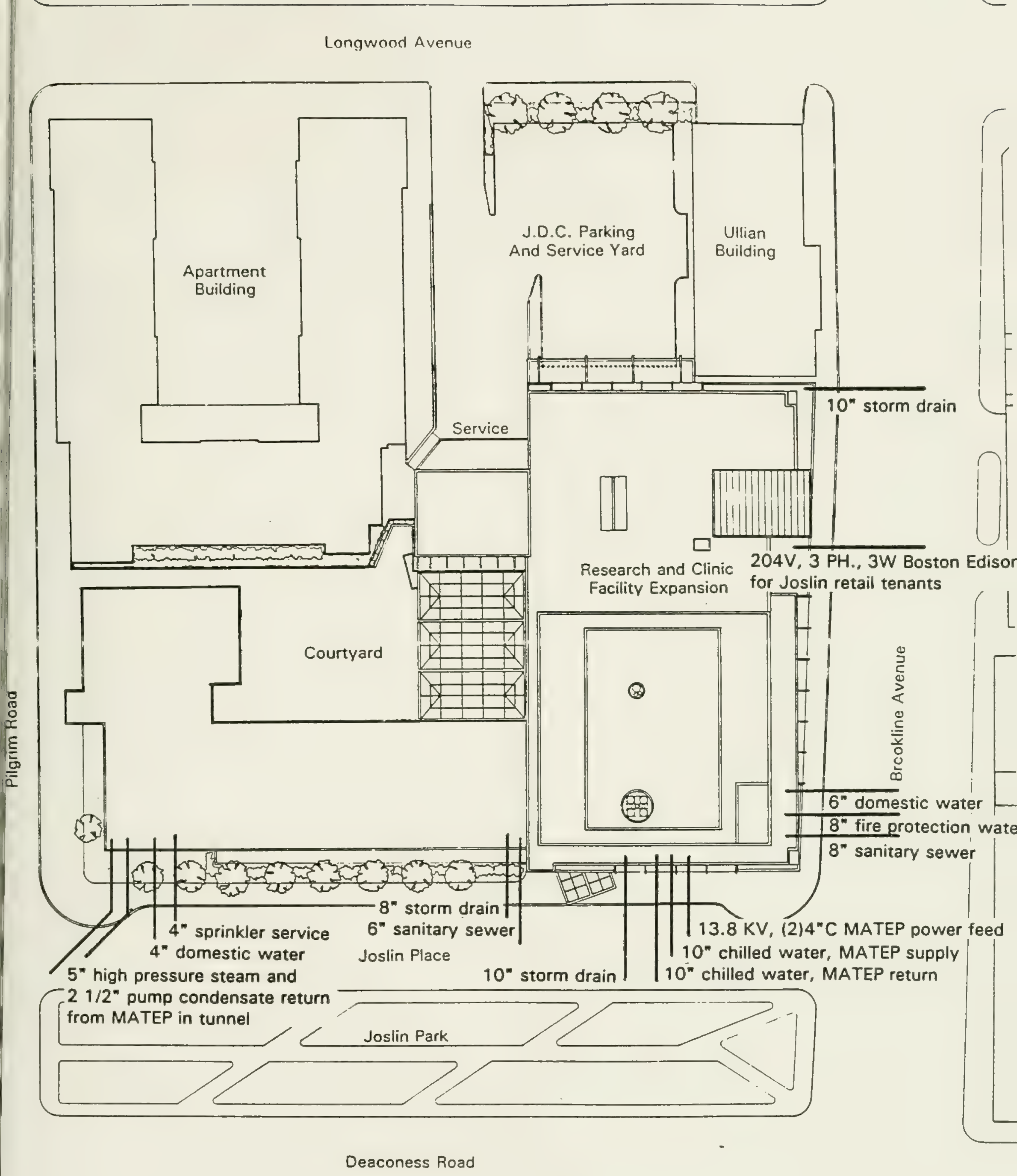
	Present Demand	Future Demand		added demand	MATEP Capacity
Chilled Water	800	1400	Tons	600	25000
% of MATEP	3.2	5.6			
Steam	5000	11000	#/HR	6000	300000
% of MATEP	1.7	3.7			
Electricity	850	1600	KW	750	58000
% of MATEP	1.5	2.8			


Joslin Diabetes Center
Steam Demand
#/HR
(Thousands)
0
1
2
3
4
5
6
7
8
9
10
11
12
5000
11000
Present Demand
Future Demand



Joslin Diabetes Center
Electrical Demand
KW
(Thousands)
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
850
1600
Present Demand
Future Demand


Joslin Diabetes Center
Chilled Water Demand
TONS
(Thousands)
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
800
1400
Present Demand
Future Demand



Infrastructure Location Plan

Joslin Diabetes Center

Appendix G

The Boston Redevelopment Authority's Scoping Determination is included on the following pages in order that reviewers can compare the information and data contained within the F.F.I.R. with that originally requested as scope requirements.

STON
EDEVELOPMENT
THORITY

ymond L. Flynn

ehen Coyle

ity Hall Square
n, MA 02201
722-4300

December 17, 1990

RECEIVED
DEC 28 1990
Ellenzweig Associates, Inc.

Ms. Constance L. Stubbs
Administrator
Joslin Diabetes Center
One Joslin Place
Boston, MA 02115

Re: Joslin Diabetes Center Research and Clinic Facility Expansion

Dear Ms. Stubbs:

Enclosed is the Scoping Determination for the Joslin Diabetes Center Research and Clinic Facility Expansion (the "Proposed Project"), for which you submitted a Project Notification Form ("PNF") pursuant to Article 31 of the Boston Zoning Code. This Scoping Determination requests information required by the Boston Redevelopment Authority in response to the PNF submitted June 19, 1990.

Additional information may be required during the course of review of the Proposed Project. If you have any questions regarding the Scoping Determination or the review process in connection with the Proposed Project, please contact me at 722-4300, extension 4286.

Sincerely,

Gerry Kavanaugh
Director of Institutional Planning

RECEIVED
DEC 21 1990
JOSLIN DIABETES CENTER, INC.

Enclosure

P/PM	M.R.
WORKING COPY	ET, MR
JOB NAME #	28913.00
FILE	5B.3

BOSTON REDEVELOPMENT AUTHORITY

SCOPING DETERMINATION

JOSLIN DIABETES CENTER
RESEARCH AND CLINIC FACILITY EXPANSION

SUBMISSION REQUIREMENTS
FOR DRAFT PROJECT IMPACT REPORT

PROPOSED PROJECT:	Joslin Diabetes Center Research and Clinic Facility Expansion
PROJECT LOCATION:	One Joslin Place at Brookline Avenue
APPLICANT:	Joslin Diabetes Center

The Boston Redevelopment Authority ("BRA") is issuing this Scoping Determination pursuant to Section 31-5 of the Boston Zoning Code (the "Code"). The applicant filed a Project Notification Form ("PNF") on June 19, 1990. The Scoping Determination requests information required by the BRA for its review of the Proposed Project in connection with the following:

(a) Development Review pursuant to Article 31 of the Code; and

(b) Recommendations to the Board of Appeal with respect to the zoning relief for the Proposed Project, pursuant to Articles 6 and 7 of the Code.

PREAMBLE

The BRA is reviewing the Proposed Project pursuant to multiple sections of the Code. With the consent of Joslin Diabetes Center, the Proposed Project is being reviewed pursuant to Article 31, Development Review Requirements, which sets out a comprehensive procedure for project review and requires the BRA to review the design, transportation, environmental, and other impacts of proposed projects. Article 31 requires the submission of a satisfactory Final Project Impact Report prior to the issuance of a building permit.

In addition, the Proposed Project requires zoning relief pursuant to Articles 6 and 7 of the Code. In order to be granted each type of zoning relief, a different set of criteria must be satisfied.

The Proposed Project may require variances under Article 7 for the following deviations from the Code:

- Floor Area Ratio
- Building Height
- Side Yard Setback

Conditions for approval of variances are outlined in Section 7-3 of the Code.

The Proposed Project also requires conditional use permits for the following uses:

- Research laboratory
- Laboratory animal housing
- Outpatient clinic or professional offices accessory to hospital uses

Conditions required for approval of a conditional use permit are outlined in Section 6-3 of the Code.

I. JOSLIN DIABETES CENTER RESEARCH AND CLINIC FACILITY EXPANSION PROJECT DESCRIPTION

The Proposed Project is located on the campus of Joslin Diabetes Center in Boston, Massachusetts. The site of the Proposed Project lies in two zoning districts, according to the Code. A portion of the area is in an L-1 zone, and the remainder is in an H-2 zone. Joslin Diabetes Center proposes to build an addition of 84,230 GSF (74,420 FAR SF) to its existing Howard F. Root Wing, built in 1976. The Proposed Project, comprised of three stories and a mechanical penthouse, will be constructed above the four-story Howard F. Root Wing. The existing structure was designed and built to accommodate a vertical addition of this scale, and the elevator core was built to a height of seven stories at the time of the original building's construction to facilitate this type of vertical expansion. The Proposed Project will allow additional space for both patient care and medical research functions. To date, the increase in the volume of outpatient services and medical research undertaken at Joslin has not been matched by a comparable increase in available space. The Proposed Project will address these insufficiencies without significantly altering the types of uses that are in place in the existing facility.

The existing campus of Joslin Diabetes Center is approximately 1.3 acres (56,840 SF). The FAR square footage of existing buildings is 148,810 SF (166,240 GSF), yielding an existing campus FAR of 2.62.

The Proposed Project will add 74,420 FAR SF (84,230 GSF). Total FAR SF would then be 223,230 (250,470 GSF), yielding a campus FAR of 3.93. The height of the existing Root Wing is approximately 50 feet. The addition of the Proposed Project will result in a height of approximately 100 feet to the top of the new penthouse roof. Components of the Proposed Project include:

(a) Construction of three new floors and a mechanical penthouse, above the existing fourth floor;

(b) Infilling the existing courtyard at Brookline Avenue to provide clinical space that is easily accessible to eye patients;

(c) Raising the existing outdoor courtyard to the Pilgrim Road level. A portion of this courtyard would be enclosed for visitor and staff lounge functions; and

(d) Development of a new main entrance on Joslin Place through the construction of a new first floor lobby.

II. JOSLIN DIABETES CENTER MASTER PLAN

In June, 1990, Joslin Diabetes Center submitted to the BRA a Draft Master Plan. Joslin Diabetes Center has submitted copies of the Master Plan to the Chair and members of the Mission Hill Planning and Zoning Advisory Committee ("PZAC"). The community and BRA staff review of the Master Plan and the proposed Research and Clinic Facility will occur simultaneously, since the Proposed Project is the only significant project contemplated for Joslin's Longwood campus over the next decade.

III. COMMUNITY REVIEW OF THE PROPOSED PROJECT

BRA staff and the Mayor's Office of Neighborhood Services will work with Joslin Diabetes Center and the Mission Hill PZAC to facilitate the community review of the Proposed Project and the Hospital's Master Plan. Joslin has presented copies of the Master Plan to the PZAC Chair and members, and a PZAC meeting to discuss the Proposed Project was held on October 2, 1990. Particular issues which Joslin may be asked to address will be defined as the PZAC review progresses. It is expected that this process will be completed in the winter of 1991.

IV. DEVELOPMENT REVIEW REQUIREMENTS - ARTICLE 31

SUBMISSION REQUIREMENTS

In addition to full-size scale drawings, 15 copies of a bound booklet containing all submission materials reduced to size 8-1/2" x 11", except where otherwise specified. In addition, an adequate number of copies must be available for community review.

A. GENERAL INFORMATION

1. Applicant Information

a. Development Team

(1) Names

(a) Developer (including description of development entity and type of corporation)

(b) Attorney

(c) Project consultants

(2) Business address and telephone number for each

(3) Designated contact for each

b. Legal Information

(1) Legal judgments or actions pending concerning the Proposed Project.

(2) Evidence of site control over the project area, including current ownership and purchase options of all parcels in the Proposed Project, all restrictive covenants and contractual restrictions affecting the proponent's right or ability to accomplish the Proposed Project and the nature of the agreements for securing parcels not owned by the prospective developer.

(3) Nature and extent of any and all public easements into, through, or surrounding the site.

2. Financial Information (See Appendix 1 for required financial information, which may be submitted under separate cover)

Development and Operating Pro Formas must be provided for the Proposed Project.

a. Full disclosure of financing references

b. Development Pro Forma

c. Ten (10) Year Operating Pro Forma

3. <u>Project Area</u>

a. Description of metes and bounds of project area and/or certified survey of project area

4. <u>Public Benefits</u>

a. Adjustment in tax revenues, specifying existing and estimated future Payment In Lieu of Taxes (PILOT).

b. Anticipated employment levels including the following:

(1) Estimated number of construction worker years

(2) Estimated number of net new permanent jobs.

c. Other public benefits, if any, to be provided.

5. <u>Regulatory Controls and Permits</u>

a. Existing zoning requirements, zoning computation forms, and any anticipated requests for zoning relief should be explained.

b. Anticipated permits required from other local, state, and federal entities with a proposed application schedule should be noted.

c. If the Proposed Project is subject to the Massachusetts Environmental Policy Act (MEPA), all required documentation should be provided to the BRA, including, but not limited to, copies of the Environmental Notification Form and the proposed schedule for coordination with BRA procedure.

6. <u>Community Groups</u>

a. Names and addresses of project area owners, displacees, abutters, and also any community groups which, in the opinion of the applicant, may

be substantially interested in or affected by the Proposed Project.

b. A list of meetings proposed and held with interested parties.

B. TRANSPORTATION COMPONENT

A Transportation Access Plan shall be prepared as defined by the Scope of Services outlined in Appendix 2.

C. ENVIRONMENTAL PROTECTION COMPONENT

1. Wind

A qualitative analysis of the potential wind impacts of the Proposed Project at the pedestrian level shall be required for the Draft Project Impact Report. This analysis shall determine potential pedestrian level winds adjacent to and in the vicinity of the project site and shall identify any areas where wind velocities are expected to exceed acceptable levels.

Particular attention must be given to public and other areas of pedestrian use, including, but not limited to, building entrances and sidewalks and other public areas adjacent to the building. For areas where wind speeds are projected to exceed acceptable levels, measures to reduce wind speeds and to mitigate potential adverse impact must be identified.

Should the qualitative analysis indicate the possibility of excessive pedestrian level wind speeds, additional studies, including wind tunnel testing, may be required for the Final Project Impact Report.

2. Shadow

A shadow analysis is required for existing build conditions for the hours 9:00 a.m., 12:00 noon, and 3:00 p.m. for the vernal equinox, summer solstice, autumnal equinox, and winter solstice. Note that due to time differences (daylight savings versus standard), the autumnal equinox shadows would not be the same as the vernal equinox shadows and therefore separate shadow studies are required for the vernal and autumnal equinoxes.

The shadow impact analysis must include net new shadow as well as existing shadow and must clearly show the incremental impact of the Proposed Project.

Particular attention must be given to existing or proposed public open spaces and major pedestrian areas, including, but not limited to, the sidewalks adjacent to the building. Design or other mitigation measures to limit or minimize any adverse shadow impact must be identified.

3. Geotechnical Impact

An analysis of existing sub-soil conditions, groundwater levels, potential for ground movement and settlement during excavation, and potential impact on adjacent buildings and utility lines is required. This analysis must also include a description of the foundation construction methodology, the amount and method of excavation, measures to prevent any adverse effects on adjacent buildings and utility lines, and measures to ensure that groundwater levels will not be lowered during or after construction.

4. Solid Wastes

The generation of solid wastes (construction period and operation of the project) and of biomedical wastes and plans for removal and disposal must be described. Measures to promote recycling and reduction of waste generation are required and must be described in the DPIR.

5. Construction Impacts

A construction impact analysis must include a description and evaluation of the following:

(a) potential dust and pollutant emissions and mitigation measures to control these emissions and avoid adverse impacts on patients of adjacent hospital facilities.

(b) potential noise impact and mitigation measures to minimize increase in noise levels and avoid any adverse impacts on patients of adjacent hospital facilities.

(c) location of construction staging areas and construction worker parking.

(d) construction schedule, including hours of construction activity.

(e) access routes for construction trucks and anticipated volume of construction traffic.

(f) measures to protect the public safety of pedestrians in the vicinity of the work areas and patients in adjacent hospital facilities.

6. Rodent Control

An analysis of the impact of the Proposed Project's construction on rodent populations and a description of the proposed rodent control program, including frequency of application, and compliance with applicable City and State regulatory requirements is required.

D. URBAN DESIGN COMPONENT

The Proposed Project elements should be developed so as to (1) strengthen the overall urban design of the Joslin Diabetes Center area, (2) enhance the relationships among existing buildings, and (3) enhance the relationships between the buildings and the streets and open spaces. The new construction should be compatible in footprint, massing, height, fenestration, details, and materials with existing structures. The proposed new construction should also reinforce the existing pedestrian environment on and around the site and campus. In addition, the proposed project elements should be designed and constructed so as to minimize visibility from the view angles of the surrounding community.

In order to determine that the proposed project is (a) architecturally compatible with surrounding structures; (b) exhibits an architectural concept that enhances the urban design features of the area in which it is located; and (c) augments the quality of the pedestrian environment, the following items must be submitted:

1. a written description of program elements and space allocation for each element;

2. a plan for the surrounding area and district and sections at an appropriate scale (1" = 50' or larger) showing relationships of the proposed project to the surrounding area and district with regard to

a. massing,

b. building height,

c. scaling elements,

d. open space,

e. major topographic features,

f. pedestrian and vehicular circulation, and

g. land use;

3. black and white 8"x10" photographs of the site and neighborhood;

4. sketches and diagrams of earlier proposals to clarify design issues and massing options;

5. an eye-level perspective (reproducible line drawings) showing the proposal in the context of the surrounding area;

6. aerial views of the project;

7. site sections at 1" = 20' or larger showing relationships to adjacent buildings and spaces;

8. a site plan at an appropriate scale (1" = 20' or larger) showing:

a. general relationships of proposed and existing adjacent buildings and open space,

b. open spaces defined by buildings on adjacent parcels and across streets,

c. general location of pedestrian ways, driveways, parking, service areas, streets, and major landscape features,

d. pedestrian, handicapped, vehicular and service access and flow through the parcel and to adjacent areas,

e. survey information, such as existing elevations, benchmarks, and utilities,

f. phasing possibilities, and

g. construction limits;

9. a massing model at 1" = 40' and a study model at 1" = 16' showing facade design;

10. drawings at an appropriate scale (e.g., 1" = 8') describing architectural massing, facade design and proposed materials including

a. building and site improvement plans,

b. elevations in the context of the surrounding area,

c. sections showing organization of functions and spaces, and

d. preliminary building plans showing ground floor and typical upper floor(s); and

11. proposed schedule for submittal of design development materials.

Submission materials for Design Development and Contract Documents submissions can be found in Appendix 3.

E. HISTORIC RESOURCES COMPONENT

The DPIR must include an historic resource analysis which assesses the impacts of the Proposed Project's height, scale, massing, and other relevant environmental factors on any historic districts or buildings in the vicinity or on the site of the Proposed Project. In addition, the DPIR must include an assessment of the potential presence of any archaeological resources which may be disturbed by the construction of the Proposed Project.

F. INFRASTRUCTURE SYSTEMS COMPONENT

The 76,000 GSF (exclusive of penthouse) expansion of the existing structure should have minimal adverse effects on infrastructure systems. Energy is supplied by the MASCO Total Energy Plant; it is presumed that water, sewerage and storm drain connections will remain as existing. No significant new impacts would be expected.

A brief standard analysis of infrastructure systems impacts is recommended, however, to confirm the above in light of area system capacities, and to propose mitigation if any impacts exist.

The submission must include an evaluation of the Proposed Project's impacts on the capacity and adequacy of existing water, sewerage and drainage, energy (including gas and steam), electrical (including telephone, cable, computer, fire/emergency, etc.), and utility systems, and the need reasonably attributable to the Proposed Project for additional systems facilities.

Appendix 1

REQUIRED FINANCIAL INFORMATION

REQUIRED FINANCIAL INFORMATION
JOSLIN DIABETES CENTER
RESEARCH AND CLINIC FACILITY EXPANSION

DEVELOPMENT PRO FORMA includes all the information normally found in a development pro forma, by phase. This includes, but is not limited to:

- Land costs, per land square foot and total, by parcel, including any incremental disposition cost attributed to the project.

- Attribution of acquisition expense over project components (per FAR square foot, clinical, research, office, etc.)

- All hard costs on a per-unit and total basis by phase (disaggregated into base building, tenant improvement work, site work, furniture, fixtures and equipment, FF&E, etc.)

- All soft costs on a per-unit and total basis, (disaggregated into individual line items such as architectural, engineering, legal, accounting, and developer's fees, and any other professional fees, insurance, permits, etc.)

- All contingencies, on a per-unit and total basis, by phase (specify whether contingency is on hard costs, soft cost, or total cost).

- All assumptions regarding financing terms on acquisition, pre-development, construction and permanent loans, by phase (including financing fees, interest rates, drawdown assumptions, terms, participations, amortization).

- Any other project-related expenses not within any of the above categories.

- Calculation of Total Development Cost (TDC) by component, including total and per unit breakdown (e.g., per square foot clinical, research, office, etc.).

- Sources of debt and equity for total project costs.

- Projected financing sources, including bond issuing agencies such as HEFA or MIFA, banks, institutional investors, private, corporate or government donors (an analysis of the costs versus benefits of the financing options, including interest costs and loan terms, as well as a comparison between available sources, should be included).

10-YEAR OPERATING PRO FORMA includes all the information normally found in an operating pro forma, on a yearly basis. This includes, but is not limited to:

- o Tabulation of gross and net (leasable) square feet for all clinical, research, office, or other use spaces.
- o Schedule of all rents on a per square foot and total basis of space not operated directly by the institution.
- o Anticipated operating expenses on per square foot and total basis, and clear explanation of division of expenses between owner and tenant (includes all commercial space).
- O Tenant inducements, including rent concessions (indicate magnitude of discount from market rates), free rent, tenant improvement allowances, etc. for commercial space.
- o All other expense assumptions including property management fees.
- o Anticipated leasing patterns (15 year, 10 year, etc.), lease-up rates, etc., for commercial space.
- o Calculation of debt service.
- o Anticipated timing of future refinancing.
- O For research space, projections of grant income from government, corporate, philanthropic, or other entities.

Appendix 2

TRANSPORTATION ACCESS PLAN
SCOPE OF SERVICES

SCOPE OF SERVICES
TRANSPORTATION ACCESS PLAN
JOSLIN DIABETES CENTER
RESEARCH AND CLINIC FACILITY EXPANSION
BOSTON, MASSACHUSETTS

SCOPE OF SERVICES

A. DESCRIPTION OF SERVICES

Joslin Diabetes Center will prepare a Transportation Access Plan for the proposed new construction project in accordance with the requirements of the Boston Redevelopment Authority (BRA) and the Boston Transportation Department (BTD). The Access Plan must include the following:

- A definition of existing traffic, parking and transit conditions in the area as shown in Joslin's Institutional Master Plan.
- An evaluation of short-term traffic impacts related to construction activity.
- An evaluation of long-term impacts on traffic generation and parking demand.
- Identification of appropriate measures to mitigate transportation impacts.
- Monitoring of long-term travel behavior.

The Access Plan should incorporate information from previous transportation studies conducted in the area, particularly the Longwood Medical Area Transportation Study and Joslin's Institutional Master Plan.

B. STUDY AREA

Since the primary access to the project area is provided via Longwood Avenue the traffic analysis must focus on the following intersections:

(1) Longwood Avenue and Brookline Avenue
(2) Longwood Avenue and the Riverway.

C. DEFINITION OF TASKS

Task 1 - Identification of Existing Transportation Conditions

Joslin Diabetes Center must present data on supply and usage characteristics of the various transportation systems within the study area.

1.1 Traffic. Daily and peak hour traffic volume data from the Institutional Master Plan must be reported for Longwood Avenue, Brookline Avenue, the Riverway, Pilgrim Road, Joslin Place, and Deaconess Road.

1.2 Parking. Parking characteristics at all facilities which may be affected by the Proposed Project must be defined. Information from the Institutional Master Plan relating to parking supply, demand, and fees must be presented.

1.3 Transit. Public transportation information from the Institutional Master Plan must be presented.

Task 2 - Long-Term Transportation Impacts

Expected long-term transportation impacts in the study area must be estimated and evaluated. These include:

2.1 Trip Generation. Travel demand data gathered from existing facility users must be used to estimate net new peak-hour and daily vehicle trips.

2.2 Impact Analysis. The project's transportation impacts must be presented as described below:

1. Traffic Impacts - Volume/capacity ratio (V/C), delay, and level-of-service (LOS) calculations at the analysis intersections must be presented for three conditions, as in the Institutional Master Plan:

   o Existing
   o 1993 Without Improvements (assuming the Proposed Project is built), and
   o 1993 With Improvements (assuming the Proposed Project is built).

2. The project-generated parking demand must be allocated to nearby and remote parking facilities according to expressed Joslin parking policy. Project-generated parking demand must^R be added to existing demand and projected demand increases at all affected facilities, and compared with existing supply and projected supply increases to identify deficiencies.

Task 3 - Impacts During Construction Period

The transportation assessment must include an evaluation of the impacts of the project during the construction period, including the following:

1. Estimated number of daily construction worker trips by mode;

2. Frequency of truck movements and construction activities;

3. Provisions for construction worker parking and construction materials deliveries;

4. Temporary storage of construction equipment and materials; and

5. The need (if any) for street occupancy permits during construction;

6. A Construction Management Plan fully detailing these issues must be submitted to and approved by BTD prior to the issuance of a building permit.

Task 4 - Development of Mitigation Measures

Mitigation measures which would lessen the impacts of the proposed project on the transportation system must be identified. These mitigation measures shall include:

- Measures to minimize trip generation;
- Roadway/traffic operation improvements; and
- Transit improvements.

Specific commitments to be made by the developer must be identified.

Task 5 - Report Preparation. The results of the above effort must be incorporated into a "Transportation Access Plan" which describes the work performed during the study and documents the study process, procedures, and findings for use by the BRA and the BTD.

Appendix 3

SUBMISSION REQUIREMENTS FOR DESIGN DEVELOPMENT AND CONTRACT DOCUMENTS SUBMISSIONS

Phase II Submission: Design Development

1. Revised written description of project.

2. Revised site sections.

3. Revised site plan showing:

   a. Relationship of the proposed building and open space and existing adjacent buildings, open spaces, streets, and buildings and open spaces across streets.

   b. Proposed site improvements and amenities including paving, landscaping, lighting and street furniture.

   c. Building and site dimensions, including setbacks and other dimensions subject to zoning requirements.

   d. Any site improvements or areas proposed to be developed by some other party (including identification of responsible party).

   e. Proposed site grading, including typical existing and proposed grades at parcel lines.

4. Dimensioned drawings at an appropriate scale (e.g., 1" = 8') developed from approved schematic design drawings which reflect the impact of proposed structural and mechanical systems on the appearance of exterior facades, interior public spaces, and roofscape including:

   a. Building plans

   b. Preliminary structural drawings

   c. Preliminary mechanical drawings

   d. Sections

   e. Elevations showing the project in the context of the surrounding area as required by the Authority to illustrate relationships or character, scale and materials.

5. Large-scale (e.g., 3/4" = 1'-10") typical exterior wall sections, elevations and details sufficient to describe specific architectural components and methods of their assembly.

6. Outline specifications of all materials for site improvements, exterior facades, roofscape, and interior public spaces.

7. Eye-level perspective drawings showing the project in the context of the surrounding area.

8. Samples of all proposed exterior materials.

9. Complete photo documentation (35 mm color slides) of above components including major changes from initial submission to project approval.

Phase III Submission: Contract Documents

1. Final written description of project.

2. A site plan showing all site development and landscape details for lighting, paving, planting, street furniture, utilities, grading, drainage, access, service, and parking.

3. Complete architectural and engineering drawings and specifications.

4. Full-size assemblies (at the project site) of exterior materials and details of construction.

5. Eye-level perspective drawings or presentation model that accurately represents the project, and a rendered site plan showing all adjacent existing and proposed structures, streets and site improvements.

6. Site and building plan at 1" - 100' for Authority's use in updating its 1" = 100" photogrammetric map sheets.

Phase IV Submission: Construction Inspection

1. All contract addenda, proposed change orders, and other modifications and revisions of approved contract documents which affect site improvements, exterior facades, roofscape, and interior public spaces shall be submitted to the BRA prior to taking effect.

2. Shop drawings of architectural components which differ from or were not fully described in contract documents.

The Boston Redevelopment Authority's Preliminary Adequacy Determination is included in the following pages in order that reviewers can compare the information and data contained within the F.F.I.R. with the revisions to the D.P.I.R. which were requested.

BOSTON
REDEVELOPMENT
AUTHORITY

Raymond L. Flynn
Mayor

Stephen Coyle
Director

One City Hall Square
Boston, MA 02201
(617) 722-4300

June 24, 1991

Ms. Constance L. Stubbs
Administrator
Joslin Diabetes Center
One Joslin Place
Boston, MA 02115

Dear Ms. Stubbs:

RE: Joslin Diabetes Center Research and Clinic Facility Expansion.

This letter is the Preliminary Adequacy Determination (the "Determination") of the Boston Redevelopment Authority (the "BRA") with respect to the Draft Project Impact Report (the "DPIR") for the proposed Joslin Diabetes Center Research and Clinic Facility Expansion (the "Project"), submitted to the BRA on March 18, 1991.

The BRA is issuing this Determination pursuant to Section 31-5 of the Boston Zoning Code (the "Code"). This Determination requests information required by The BRA for its review pursuant to Article 31 of the Code.

PREAMBLE

The BRA is reviewing the Project pursuant to multiple sections of the Code. With the consent of the Proponent, Joslin Diabetes Center, the BRA is reviewing the Project pursuant to Article 31 of the Code, Development Review Requirements, which sets out a comprehensive procedure for project review, and requires the issuance of a Final Adequacy Determination prior to issuance of a building permit. The Final Adequacy Determination is issued upon determination by the BRA that the Final Project Impact Report (the "FPIR") is satisfactory.

The Proposed Project also requires zoning relief pursuant to Articles 6 and 7 of the Code.

The substantive review requirements imparted by the aforementioned sections of the Code address related, but not identical, issues. The reviews, however, overlap to a significant degree. Therefore, the BRA is incorporating its review of zoning relief for the

Project into the Article 31 process to eliminate regulatory duplication and consolidate the Project's review into one process and one set of documents.

PROJECT REVIEW

On the basis of the submitted DPIR, the Proponent applied to the Inspectional Services Department for a building permit on May 16, 1991. The project requires approval by the Board of Appeal of conditional use permits and variances under Articles 6 and 7 of the Code. In order to be granted each type of zoning relief, a different set of criteria must be satisfied.

The Proposed Project will require variances under Article 7 for the following deviations from the Code:

-Floor Area Ratio
-Building Height
-Side Yard Setback

Conditions required for approval of a variance are outlined in Section 7-3 of the Code.

The Proposed Project also will require conditional use permits for the following uses:

-Clinic not accessory to a main use
-Research Laboratory
-Laboratory animal housing
-Outpatient clinic or professional offices accessory to hospital uses

Conditions required for approval of a conditional use permit are outlined in Section 6-3 of the Code.

But for the required corrections, clarifications, and additional information referenced in the attached Technical Appendix, the DPIR submitted is sufficient to satisfy the scoping requirements.

We look forward to reviewing the Final Project Impact Report.

Sincerely,

Gerard Kavanaugh
Director of Institutional Planning

Enclosure

TECHNICAL APPENDIX
TO THE
PRELIMINARY ADEQUACY DETERMINATION
FOR
JOSLIN DIABETES CENTER
RESEARCH AND CLINIC FACILITY EXPANSION

I. DEVELOPMENT REVIEW REQUIREMENTS - ARTICLE 31

Article 31 of the Code institutes a process by which large scale development projects will be reviewed by the BRA. In its review of the DPIR, the BRA has identified certain components which are insufficient and which the proponent must modify, and additional information which the BRA requires in order to issue a final Adequacy Determination. The following is a description of the sufficiency of the materials submitted in the DPIR, and the additional materials which the Proponent must include in the FPIR.

A. GENERAL INFORMATION

The scoping determination issued by the BRA was not included in the DPIR. This should have been included in order that the reviewer may be able to determine whether or not the information and data contained in the document adequately respond to the scope requirements.

B. TRANSPORTATION COMPONENT

The Proponent is currently revising a Transportation Access Plan ("TAP") Agreement. A TAP Agreement must be finalized prior to the formal submission to the BRA of Design Development documents.

The following are comments made in regard to the Draft Transportation Access Plan:

P.19 (No Build Conditions) In line 4, "morning" peak hour should be "evening" peak hour (see Table 6). On Table 6 it is implied that the widening of Longwood Avenue will occur, and that it will improve the level of service at the intersection of Brookline and Longwood Avenues, but only if the Joslin facility is constructed as defined in the build situation. The footnote which refers to the widening should be indicated in the no-build situation as well as the build situation to clarify that the widening is not dependent on construction of the Joslin facility.

P.25 The parking fees section has an incomplete sentence which should be clarified.

C. ENVIRONMENTAL COMPONENT

Wind Impact Analysis

The conclusion of the wind impact analysis is that the Joslin expansion project would have minimal effect on pedestrian-level winds in the vicinity of the project site. Winds are expected to remain the same or may be slightly reduced. Within the new central courtyard, the existing swirling flow is expected to be considerably reduced or even eliminated, but accelerated flows are projected under northeast wind conditions in the courtyard and at the project entrance from the courtyard. The report recommends the erection of a one-story wind break in the gap between the elevator tower and the Longwood Gardens apartment building to reduce the accelerated flow. This mitigation measure should be implemented as part of the proposed project.

P.7 (Wind Speed) In line 2, the average Logan wind speed is given as 2.3 mph; in figure 4, it is given as 12.9 mph. This discrepancy should be clarified.

Shadow Impacts

The shadow analysis indicates that the impact of the project will be minimal, with some incremental shading in the new central courtyard and in Joslin Park during the spring, summer and fall mornings and in the Joslin parking lot and along Longwood Avenue in the afternoons during those same seasons. The greatest amount of additional shadow will fall on the Winsor School playing field in the winter afternoon, a time when it would not be in use.

P.2 (Sun Angles) In line 4, the summer solstice should be June 21, not July 21, as defined.

P.5 (Time) In the last line, "vernal" equinox should be "autumnal" equinox.

Fig. 5: It would appear that the shadow in the western end of the courtyard should be shown as "net new shadow" rather than "existing shadow" (page 12 does indicate that the courtyard would experience some incremental shading during spring mornings). This condition should be clarified and revised, if necessary.

D. URBAN DESIGN COMPONENT

The information presented in the DPIR, together with subsequent required submissions, represents an acceptable schematic design for the Proposed Project.

E. HISTORIC RESOURCES COMPONENT

The FPIR must restate and document the assertion that the Proposed

Project will have no impacts on nearby historic or archeological resources as required in the Scoping Determination.

F. INFRASTRUCTURE SYSTEMS COMPONENT

The infrastructure analysis does not provide any information regarding the demands which will be placed on the various utility systems nor on the adequacy of those systems to serve those demands. Joslin should provide a simple table of energy consumption comparisons (existing vs. proposed), with the totals expressed separately as a percentage of MATEP's existing capacity and a diagram visually showing the utility connections now referenced only in written form. It is presumed that no additional connections or upgradings are required from any other utility network. Joslin should verify this presumption.

II. AGREEMENTS

In addition to completing the Development Review Requirements process, the agreements and plans listed below must be provided in form and context satisfactory to the appropriate signatory public agencies before building permits may be issued for the Project:

A) Transportation Access Plan (TAP) Agreement;

B) Traffic Maintenance Plan in conformity with the City's Construction-Management Plan;

C) Boston Residents Construction Employment Plan, pursuant to Chapter 12 of the ordinances of 1986 of the City of Boston, as amended by Chapter 17 of said Ordinances, and Executive Order Extending Boston Residents Job Policy, signed by the Mayor on July 12, 1985; and

D) First Source Agreement with the Mayor's Office of Jobs and Community Services.

The following is a letter which clarifies agreements referenced in the Preliminary Adequacy Determination.

Joslin Diabetes Center

Dedicated to Diabetes Research, Treatment, Education, and Youth Programs

One Joslin Place
Boston, Massachusetts 02215

(617) 732-

September 25, 1991

Mr. Gerard Kavanaugh
Director of Institutional Planning
Boston Redevelopment Authority
One City Hall Square
Boston, MA 02201

Dear Gerry:

This week Joslin is submitting the Final Project Impact Report (FPIR) for the Research and Clinic Facility Expansion. I believe it provides all the information requested in the Technical Appendix which accompanied the Preliminary Adequacy Determination of June 24, 1991.

There is one note of clarification needed regarding Section II of the Technical Appendix. The section referenced agreements and plans which must be completed prior to the issuance of a building permit. They are listed below along with a comment about our status on each.

A) Transportation Access Plan Agreement

The primary commitments of the Access Plan have been made with Boston Transportation Department and are included in the FPIR.

B) Traffic Maintenance Plan in conformity with the Construction Management Plan

These plans will be developed as soon as a builder is named.

C) Boston Residents Employment Plan
D) First Source Agreement

Based on information from the Office of Jobs and Community Services, we understand that the Boston Residents and First Source provisions apply to projects of 100,000 square feet or more. As our project is under that threshold, we will be following the approach outlined in our community benefits statement: making best voluntary efforts to abide by Boston Residents Jobs Policy, targeting job opportunities to residents of Mission Hill, working with the Private Industry Council, and other specific recruitment and training endeavors. The full statement is in the FPIR.

Thank you again for the hours you and your staff have invested in helping us develop the project in a way that serves both the local community and the population with diabetes. We are looking forward to the final steps in the public review: the zoning hearing on October 28 and final City approvals. The project is moving forward steadily. Thanks again.

Sincerely,

Connie

Constance L. Stubbs
Administrator